

CWM CHEMICAL SERVICES, INC.

CHICAGO INCINERATOR FACILITY

CHICAGO, ILLINOIS

**FINAL
RCRA FACILITY INVESTIGATION
REPORT**

APPENDIX R

**VOLUME 5 OF 5
FEBRUARY 1995**

CWM CHEMICAL SERVICES, INC.
CHICAGO INCINERATOR FACILITY
FINAL RCRA FACILITY INVESTIGATION REPORT
February 1995

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**APPENDIX R
RESPONSES TO USEPA COMMENTS**

Dames & Moore Job 13963-052



ATTACHMENT 1

ATTACHMENT 1
TECHNICAL REVIEW OF RFI REPORT FOR
THE CWMCS CHICAGO INCINERATOR FACILITY

PART 1

1. **Comment:** Sections 2.2.2 & 2.2.3, Pages 2-8 & 2-16. *The text identified the fill as one of the five distinct hydrogeologic units in the facility and also concluded that sand seams contained within the lower lacustrine unit are discontinuous. The fill is a man-made material consisting primarily of construction debris. Until such time that the fill material is characterized as a natural deposit, the term hydrogeologic unit is best omitted. For the purpose of this investigation, U.S. EPA would accept the classification of the fill as one of the four unconsolidated units underneath the CWMCS facility. CWMCS has not provided enough data to conclusively support the hypothesis that sand seams are discontinuous. Therefore, CWMCS must change the above statement to reflect the current understanding.*

CWM Response:

Fill material in the Final RFI Report is referred to as one of four distinctive units of unconsolidated deposits overlying bedrock. (The fill material is easily distinguishable from the underlying glacial sediments.) Each of the four distinctive units was classified based on physical properties and hydrogeologic properties. Since the fill material has a saturated zone, an unsaturated zone, behaves as a porous medium, and contains groundwater classified as Class II General Resource Groundwater, we feel that referring to the fill as a hydrogeologic unit is appropriate.

Based on soil samples collected during the investigation and subsequent testing performed on representative soil samples we feel that the glacial sediments have been adequately characterized. Additionally, Dames & Moore requested that Ms. Ardith Hansel of the Illinois State Geological Survey, Quaternary Framework Studies Section review section 2.2.2 of the Draft RFI Report. Her comments were incorporated into section 2.2.2 of the Final RFI Report. We feel our conclusion that sand seams in the lower lacustrine layer are discontinuous is accurate as we have discussed in our previous correspondence as follows:

- 1) CWMCS's General Comments, response to USEPA letter dated May 20, 1992 regarding the Interim Clay Investigation Report dated February 14, 1992. These comments were included as Attachment I in a July 2, 1992 letter from CWM to USEPA as follows:

CWM General Comments: The review comments focus on the existence of sand seams in the lower lacustrine unit. In particular, the Agency states in paragraph 2) under

General Comments that "it is the U.S. EPA's opinion that the permeable sand seams occurring in the lacustrine layers act as potential conduits for the transport of methane gas and other contaminants." This statement is a conclusion that appears to dismiss several significant facts. These are as follows:

- A) At each occurrence sand seams encountered at essentially the same depth are bounded above and below by fine grained low permeability material. It is reasonable to conclude that these sand seams are horizontal. Further, the sand seams are most prevalent in the lower lacustrine layer. The lower lacustrine layer underlies the upper lacustrine layer, and overlies the glacial till. Contaminants found in the fill material are separated from the lower lacustrine layer by the upper lacustrine layer. The upper lacustrine layer is a homogeneous, low permeability silty clay approximately 10 feet thick. Field and laboratory permeability tests on piezometers and samples from the upper layer yield geometric mean values of 2.2×10^{-7} cm/sec and 2.7×10^{-8} cm/sec, respectively, for each analysis method. Similarly, the glacial till underlying the lower lacustrine layer was also evaluated for permeability. Field and laboratory permeability tests on piezometers and samples from the till yield geometric mean values of 2.1×10^{-7} cm/sec and 8.4×10^{-7} cm/sec, respectively, for each analysis method.
- B) Laboratory permeability tests on samples collected from the lower lacustrine layer yield a geometric mean value of 6.0×10^{-7} cm/sec. Five samples for these tests were collected at depths ranging from 26 to 38 feet. The maximum value measured was 2.7×10^{-6} cm/sec on a sample from 26-28 feet from C-2. Field permeability tests performed on three piezometers installed in the lower layer yielded a geometric mean value of 7.0×10^{-6} cm/sec. These piezometers were screened from depths ranging from 29 to 36 feet. The maximum value measured was 2.0×10^{-4} cm/sec on C-2RPI screened from 30 to 35 feet. The other two values were 2.0×10^{-6} cm/sec and 8.9×10^{-7} cm/sec on C-3PI (screened from 29 to 34 feet) and C-6PI (screened from 31 to 36 feet), respectively.
- C) The permeability of the matrix of the sand would be expected to be equivalent or greater than 1×10^{-4} cm/sec. Only one test (at C-2RPI) yielded a comparable value. The remainder of the tests, including the two other piezometers screened at a depth equivalent to the first, yielded permeability values more than two orders of magnitude lower. The preponderance of low permeability values in samples from this layer, especially in piezometers screened across coarse grained intervals, indicates a restricted source for recharge (i.e. the sand seams are discontinuous).

- D) Piezometers installed during the Phase II investigation support the conclusion that the upper lacustrine layer is providing a barrier to groundwater flow. Groundwater saturating the fill material is perched above the low permeability layer. Strong downward vertical gradients measured in the piezometer nests are an indication of head loss across an impermeable barrier, typical of perched aquifer systems. They do not indicate a strong hydraulic connection.
 - E) Preliminary age dating of methane samples indicates that the gas is Pleistocene in age. The presence of naturally occurring drift gas of this age further establishes that the sand seams are isolated. The methane would have dissipated centuries ago if a permeable pathway, such as a continuous sand seam, were present.
 - F) Based on this information, it is reasonable to conclude that the sand seams are isolated within less permeable fine grained material, and are discontinuous across the biobed area. Thus, the probability for the sand seams to act as conduits for the transport of contaminants appears to be low.
- 2) CWMCS's response to specific comments #1 and #2 in a USEPA letter dated May 20, 1992 regarding the Interim Clay Investigation Report dated February 14, 1992. These comments were included as Attachment I in a July 2, 1992 letter from CWM to USEPA.
1. *Section 2.0, page 2, paragraph 3: The text states that "sand seams are interbedded in the lower layer, but do not appear to be continuous across the site." The information currently available does not support such a statement. During oversight of drilling activities, the U.S. EPA contractor, PRC Environmental Management, noted the presence of 6-inch and 2-inch thick sand interbeds at 40 feet depths at the C-3 location, and at the 32 feet depth at the C-6 boring locations. In the geologic cross section A-A' and B-B', provided in the report, (see plate 1) the above noted sand interbeds at boring locations C-3 and C-6 have conveniently disappeared. Also the presence of permeable layers at boring locations C-3, C-6, D-2 and C-2R, indicate that the sand seams maybe laterally continuous beneath the biobeds.*

Information currently available does support the above referenced statement. The above comments concern select boring locations. Sand seams were prevalent in the lower lacustrine layer beneath the biobed area, but not at C-1 and C-7. Regardless, the sand seams are separated from the fill material by the upper lacustrine layer at all locations.

The above referenced 2 inch sand seam at the 32 foot depth in the C-6 boring is noted as a sandy silt layer on the boring log included in Appendix C. The above referenced 6 inch sand seam at the 40 feet depth in C-3 is shown on the cross section; however, the Unified Soils Classification (USCS) symbol is missing. The Dames & Moore geologist recorded a 2.5 foot thick silty sand seam at this horizon.

Dames & Moore did not deliberately withhold information. The Agency seems to imply that this data was surreptitiously omitted by use of the phrase "conveniently disappeared" when discussing the notations on the cross-sections. This wording is both inappropriate and unprofessional.

During the entire time the Agency's oversight personnel was on site Dames & Moore's field personnel maintained a boring log. PRC oversight personnel wrote an occasional note, but did not maintain a boring log. If the intent of oversight was to count sand seams, PRC notes should be checked against the boring logs included in Appendix C, from which the cross-sections were developed.

2. *Section 2.0, page 3, paragraph 3: This paragraph describes the upper and lower materials comprising the lacustrine layer as having low permeabilities, continuous across the site and containing isolated permeable sand seams. The U.S. EPA agrees with the statement that the lacustrine layer is continuous across the site but disagrees with the statement that the sand seams are isolated in the lower lacustrine layer. The low permeability value assigned to the lacustrine layer will be addressed in another section. Based on information from boring logs C-2, C-2R, D-2, C-3 and C-6, permeable sand seams appear to occur consistently at the 32 feet depth beneath the biobed area. In addition, cross section B-B' clearly shows the presence of sand seams at approximately 32 through 34 feet depth at C-2, C-4, C-5 and D-3. These ten boring locations span the entire boundary of the CWM facility. Therefore, based on the above facts, it is reasonable to assume although varying in thickness, that the sand seams occurring in the lower lacustrine layer are continuous across the site.*

Further cross sections will show the boundary between the upper and lower lacustrine layers. The 32 to 34 foot horizon in the above mentioned borings (8 not 10) are in the lower lacustrine layer. They are bounded above and below by fine grained low permeability material, and therefore isolated within the lower lacustrine layer. The continuity of sand seams has been addressed in the CWM General Comments.

- 3) USEPA Comment, October 14, 1992 comments on Draft RFI Report.

Comment: Section 2.2.3.1, Page 26 of 61, Paragraph 3. *The conclusion that sand seams are discontinuous is not supported by variation of hydraulic conductivity alone. Well yield and well recharge would provide a direct indicator of the continuity of the sand seam. The conclusion that sand seams are discontinuous should be re-evaluated or substantiated with more complete information. For example, it was established in the report that a wide range in hydraulic conductivities were measured in the upper and lower lacustrine units, the glacial till and the fill material underlying the facility. However, only the sand seams in the lower lacustrine unit were interpreted as discontinuous across the site. If the varying hydraulic conductivities is the determining factor in establishing the discontinuous nature of the sand seams in the lower lacustrine unit, the same factor should have been applicable to the other stratigraphic units and these other stratigraphic units should have been interpreted as discontinuous across the site. However, these other stratigraphic units were reported as continuous across the site.*

CWMCS Response to USEPA's Comments, January 6, 1993 letter to the USEPA.

The conclusion that sand seams in the lower lacustrine layer are discontinuous was based on the lithology. (i.e. sand seams were not encountered at the same horizon or thickness across the site. These seams were a maximum of two feet in thickness; in most locations, they were only a few inches thick.) The lateral variation of hydraulic conductivity supports this conclusion.

It was established in the report that a wide range of hydraulic conductivities were measured in the lower lacustrine layer, and not in the upper lacustrine layer. Very little variation was noted in the hydraulic conductivities measured in the upper lacustrine layer. The variation of hydraulic conductivities in the glacial till was also attributed to lithology.

Well yield and well recharge provide an indirect indicator of the continuity of the sand seams. Bail recovery tests were performed on the deep clay piezometers as part of the in-situ hydraulic conductivity tests. Well recovery times for the majority of the piezometers was considerable; many required several days for full recovery.

Ardith Hansel, a quaternary geologist with the Illinois State Geological Survey who has devoted considerable research to the Wisconsin age glacial sediments of the Chicago area, was consulted by Dames & Moore regarding the discontinuous nature of these sand seams; she confirmed our interpretation.

The presence of continuous or discontinuous sand seams in the lower lacustrine layer is not significant. The lower lacustrine unit is separated from the contaminated fill unit by

the upper lacustrine unit. This unit is a homogeneous silty clay soil unit approximately 10 feet thick, in which no contaminants were measured in all soil specimens collected from this layer. Consequently, the unit behaves as a barrier to the migration of contaminants.

2. **Comment:** Section 2.2.1.3, Pages 2-13. *The text states that precipitation in the paved area of the operating part of the facility is collected, treated and discharged to the sanitary sewer. It is unclear if this collection and treatment is carried out as part of the FRI, voluntary interim measure or as a permitted treatment activity. The approved Work Plan does not include this specific activity and the facility currently does not have a permit to operate. This treatment activity should be considered during the CMS.*

CWM Response:

The text is correct as presented above. The collection of precipitation within the "operating" area of the facility is not associated with the RFI nor is the activity a voluntary interim measure. The discharge of stormwater is a permitted activity through the Metropolitan Water Reclamation District of Greater Chicago. It is agreed that the approved RFI Work Plan does not include this specific activity and that the facility currently does not have an RCRA permit to operate. The ability to treat wastewaters will be considered during the CMS.

3. **Comment:** Section 2.2.5, Page 2-46. *The text states that the vault is not in hydraulic connection with the fill, consequently, a potentiometric surface in the vault area is absent. Based on U.S. EPA's evaluation of the groundwater data and the findings listed below, the vault is in hydraulic connection with the fill unit.*

- a) *Using the scale in figure 3-2, the depth of the vault is approximately 10 feet. Clearly as provided in this REPORT, the vault is constructed within the fill unit which has an average thickness of 15 feet. Therefore, it would not be unreasonable to assume that at least spatially, one-half of the total depth of the vault, is located within this 15 feet fill unit which is the uppermost water bearing unit and through which groundwater flows both horizontally and vertically at the facility.*

CWM Response:

We feel that the potentiometric surface maps (Figures 2-6 and 2-7) correctly depict groundwater elevations in the vicinity of the vault. Additionally, the vault does not appear to be in hydraulic connection with the fill material based upon the following:

Construction documentation of the vault is not available with the exception of Figure 3-2. Figure 3-2 shows the conceptual design (prior to construction). This figure shows that

the excavation would be approximately 10 feet below grade. However, five feet of low permeability clay compacted in place was purportedly used to line the bottom and sidewalls of the vault. A groundwater mound is present west of the vault as a result of the former wastewater basin #2 (SWMU #6). No groundwater mound is present east of the vault where groundwater is encountered at approximately 10 feet below ground surface. Therefore, if the excavation were completed at approximately 10 feet below grade, and five feet of compacted clay were used to line the vault, it is apparent that the excavation for construction of the vault was completed at or near the water table, and all waste was placed above the water table.

Comment: (Section 2.2.5, Page 2-46. continued)

- b) *There is a mounding effect that is created by the vault as a result, any flow in the area of the vault would have a tendency to radiate outward from the vault. Therefore, there is likely to be a constant connection between any flow from the vault and groundwater flow in the fill. In addition, leachate from the vault was sampled during both phases of the RFI which implies that the vault is recharged by precipitation and by lake water.*

CWM Response:

No indication of a groundwater mound resulting from the vault was encountered during the investigation. Collection of leachate samples from the vault during Phase II of the investigation required numerous sampling events over an extended period of time (approximately 3 months), to collect a sufficient volume for analysis. During Phase I of the investigation, only a small volume of leachate was collected and analyzed for volatiles. Leachate in the vault may have been generated from infiltrating precipitation, as well as consolidation of stabilized waste. Infiltration of water from the lake seems highly unlikely since the lake level has remained fairly constant at an elevation below the base of the vault (see Figure 3-2 in the RFI Report).

Comment: (Section 2.2.5, Page 2-46 continued)

- c) *To reiterate, the vault is hydraulically connected with the fill. The contamination reported in wells G-302 and G-336 is likely the result of contaminant migration from the vault. Finally, as expected, a potentiometric surface is absent in the vault area because the only way to determine whether or not a potentiometric surface intersects the vault, is to install monitoring wells in the vault.*

CWM Response:

The vault liner behaves as a barrier preventing the migration of leachate from the vault, or the infiltration of groundwater into the vault. Installation of a monitoring well in the vault would only determine the pore pressure within the vault. This pore pressure, or

leachate head level, would be unrelated to the potentiometric surface measurable adjacent to the vault since waste in the vault is separated from the fill by the clay liner system of the vault.

Samples collected from G-302 and G-336 are discussed in our response to Section 4.2.6.

4. *Comment: Section 4.2.4, Pages 4-61. The text concludes that "Inorganic compounds, including metals do not indicate a contaminant distribution". We disagree with this conclusion. The reasons for the disagreement are as follows: First, based on our evaluation of the sampling data on surface soils and fill provided in the REPORT, we believe that metal and organic results for samples SS-11, SS-12 and SS-13, represent background conditions at the facility because these samples were collected from a portion of the pier that was undeveloped and uncompromised by any activities. Second, the reported cadmium and chromium concentrations in the different levels of the soil strata show that the highest concentration for cadmium and chromium detected in these background samples are 3.2 and 32mg/kg respectively.*

The highest concentration for cadmium and chromium in the fill are 7.1 and 141mg/kg, respectively, while those reported for surface soils are 55.7 and 1320 mg/kg, respectively. Third, surface soil samples SS-2, SS-3, SS-4, SS-15 and SS-16, which have the highest cadmium and chromium contamination were collected from the biobed, Hyon tank farm and the vault SWMUs. Based on the above analysis, cadmium and chromium concentrations in surface soils are two to three times higher than those detected either in background or fill samples. These contaminants may or may not be attributable to these SWMUs. The contamination in the surface soils may have originated from past waste management operations. A contaminant distribution pattern is still evident. CWMCS should have performed this type of evaluation presented above, for metal and organic constituents. We recommend that CWMCS conclusion in this section be changed.

CWM Response:

Section 4.2.4 specifically refers to groundwater contamination. Dames & Moore re-evaluated groundwater results for inorganic parameters, and determined that inorganic compounds, including metals, do not indicate a contaminant distribution pattern.

In Section 4.2.4 it is stated that the fill material appears to have a greater influence on the occurrence of metals in groundwater than the SWMUs. This statement is supported by the fact that metals were detected in surface soil samples as well as fill samples. It is impossible to determine if metals in the groundwater are a result of the SWMUs, the fill on which the SWMUs were constructed, or the fill used to backfill and re-grade the pier as part of the pier restoration project.

The reason that inorganics, metals in particular, are not useful in identifying a contaminant distribution pattern can be seen by comparing sample results from Phase I

and Phase II (see section 4.2.2 of the Final RFI Report). During Phase I, cadmium was detected in 21 of 24 RFI wells, but not detected at any sample locations during Phase II. Chromium was detected at all 24 RFI well locations during Phase I but at none of the RFI well locations during Phase II. During Phase II, chromium was detected in the FG-5 and FG-6 samples. A similar pattern was seen for almost all metals. Consequently, the metals concentrations are useless for determining a contaminant distribution from past waste management activities (i.e. SWMUs).

Surface soils which seemingly yield metal concentrations higher than fill samples cannot be linked to past waste management activities due to activities associated with the pier restoration project which was undertaken in 1981. Contaminants found in the surface soils are more likely linked to the backfill of the former SWMUs during the restoration project, rather than the actual SWMUs themselves.

5. **Comment:** Section 4.2.4, Page 4-61. *The text states that the source of organic contamination in well G-349 is likely not from the identified onsite SWMUs. U.S. EPA disagrees with this statement. Based on our assessment of the RFI report and a 1992, partial closure plan submitted by CWMCS to IEPA, the source of contamination in well G-349 is likely a series of outdoor container storage areas, southeast of the Hyon tank farm. Waste management activities occurred in these areas prior to installing the concrete and asphalt surfaces.*

CWM Response:

The potentiometric surface map developed from the Phase I data shows groundwater flow at G-349 to be in a west-southwest direction. The potentiometric surface map for Phase II shows flow at G-349 to be west-northwest. The Hyon tank farm was located several hundred feet west of well G-349. Potential container storage areas southeast of the Hyon tank farm have not been defined by the scope of this RFI for the CWMCS facility. Therefore, our conclusion that contamination detected in samples collected from G-349 is from an up-gradient source rather than from one of the SWMUs investigated during the RFI remains valid.

6. **Comment:** Section 4.2.4, Page 4-62. *The text states "These logarithmic iso concentration maps all indicate that concentration of organic compounds decrease significantly away from the SWMUs". Not only is this statement unclear, it is inconsistent with CWMCS conclusion in the preceding section. U.S. EPA requests that these concentration maps be redrawn using real (non transformed) concentration values to allow for better pictorial representation of actual conditions around each SWMU.*

CWM Response:

A logarithmic scale was used on these isoconcentration maps to show that levels of contamination are high within the boundaries of the former SWMUs. Concentrations

decline significantly outside the former SWMUs by several orders of magnitude. The logarithmic scale was necessary since contaminant levels ranged over several orders of magnitude. We feel that this section does not contradict the previous section, and that the use of a logarithmic scale is appropriate. We agreed to present data in this fashion for selected compounds in accordance with U.S. EPA's request (April 6, 1993 correspondence to CWM) and not as a requirement of the Consent Judgment.

Arithmetic isoconcentration maps for most compounds were shown to be meaningless. Examples have been attached to this document portraying the biobed area using a three-dimensional view of 1,1-DCE for both Phase I and Phase II groundwater data. As shown, high concentrations were measured at sample points several feet from locations yielding non-detection for the same compound. This extreme variability in the analytical data results in an arithmetic isoconcentration map which is more interpretation than fact. Arithmetic isoconcentration maps are impractical in situations where multiple hot spots are located within a relatively small area. Consequently, it is not practical to use this technique to give a reasonable graphic display of conditions.

7. **Comment:** Section 4.2.4, Page 4-63. *The text states that two factors such as varying hydraulic conductivity and groundwater mounding at SWMUs 1 and 6 are restricting the flow of contaminated groundwater to the lake. U.S. EPA believes that the described groundwater mounding does not necessarily restrict the flow into the lake, the mounding diverts the flow of contaminated groundwater in the fill in several directions into the lake. The contaminated groundwater moving through the fill continues to discharge into lake Calumet.*

CWM Response:

The wide range of hydraulic conductivity values calculated from slug tests performed in on-site monitoring wells indicates heterogeneous material. Since the fill material is heterogeneous, extensive high permeability layers of fill in connection with Lake Calumet are likely not present.

The clay liners from the Hyon SWMUs were partially left in place following removal of sludges and liquids as part of the pier restoration project. These remnant clay liners result in the groundwater mounds observed in SWMU #1 and SWMU #6. Infiltrating water has accumulated above the remnant clay liners creating groundwater mounds. This groundwater has saturated residual wastes remaining in the former SWMUs. This has resulted in a groundwater contaminant distribution pattern of elevated levels of organic compounds within the SWMUs, with little to no levels of contamination beyond the SWMUs. Groundwater sample results from wells located between the SWMUs and the lake, do not support the USEPA's belief that groundwater moving through the fill is contaminating the lake.

8. **Comment:** Section 4.2.5, Page 4-64. *The need for a vertically variable multilayer groundwater flow model is not clear. For example, the hydraulic conductivity of layer 2 is four orders of magnitude lower than layer 1, minimizing vertical flow between model layers. Information provided in Table 4-7 corroborates the point that only model layer 1 provides groundwater flux to Lake Calumet.*

CWM Response:

The Agency provided a simplistic, analytical approach to the determination of discharge from the pier into Lake Calumet. That approach ignored vertical hydrostratigraphic variability, as well as variabilities in discharge with distance from shore. This effect has been well-documented (e.g., McBride and Pfannkuch, 1975; Winter, 1978). The approach taken in the November 1993 report was at the next level of sophistication, in which the vertical and horizontal variabilities that were observed in the field were simulated.

9. **Comment:** Section 4.2.5.1, Page 4-64. *A 1-foot wide section of the aquifer was simulated using MODFLOW. The orientation of this section is not provided on a site base map, but should be.*

CWM Response:

The section, oriented north-south through well P-316, will be indicated on a site map.

10. **Comment:** Section 4.2.5.1, Page 4-64. *It appears that the site was simulated in cross-section rather than plan view. It also appears that the results from this 1-foot-wide "slice" were extrapolated for 1,000 linear feet of pier. The decision to use a cross-sectional model rather than the more conventional plan view model appears to be inappropriate. The rationale for configuring the groundwater flow model in cross-section should have been provided.*

CWM Response:

It is true that the conditions in the 1-foot slice were extrapolated for 1000 feet of pier, as were the conditions in the 100-foot by 100-foot areal analytical approach taken by the Agency. We believe that the assumption made by the Agency for a uniform flux across a 100x100 foot area is unrealistic. However, the approach taken in the MODFLOW simulation incorporated average, vertically variable conditions as observed in the field investigation, as opposed to the vertically homogenized conditions from which the Agency derived its conclusions.

11. **Comment:** Section 4.2.5.1, Page 4-64. *The text states that "Figure 4-2 illustrates the model configuration." This is inaccurate. Figure 4-2 presents surface water and sediment sampling locations. Also note that Figure 4-1 is titled "Simulated Groundwater Flux Into Lake Calumet." The text and figures require revision, and any missing figures should be provided.*

CWM Response:

→ The reference to Figure 4-2 will be corrected to Figure 4-1.

12. **Comment:** Section 4.2.5.1, Page 4-64. *The MODFLOW model uses 65 columns. The rationale for discretizing the model domain into 65 columns with a uniform thickness of 25 feet is not provided, but should be.*

CWM Response:

The 25-foot column width was selected to provide a cell size which would:

- Allow the simulation of horizontally variable conditions;
- Minimize mathematical instability; and
- Not be so small that the resulting model would be overly cumbersome.

The number of cells used was a function of the column width that was selected. It is the distance between the centers of adjacent piers, divided by the 25-foot column width.

13. **Comment:** Section 4.2.5.1, Page 4-65. *Figure 4-1 is titled "Simulated Groundwater Flux Into Lake Calumet." This figure is confusing and can be significantly improved by numbering rows and columns, identifying boundary conditions, providing the spatial distribution of aquifer hydraulic conductivity, identifying model calibration target well locations, and providing water level contours. Values for groundwater flux are provided, however, not all cells contain values, the values for flux do not match the values provided in Table 4-7, and the direction and orientation of the flux are not specified. The figure should be revised to address these concerns.*

CWM Response:

Specific details have not been provided on this Figure to avoid conveying so much information that it becomes confusing. For example, water levels, boundary conditions and simulated hydraulic conductivities were not shown because they are readily obtained from the model input and output (Appendix M). Additionally, the Figure only shows fluxes potentially attributable to the CWM pier. The fluxes shown on the north side of the pier (left as one views Figure 4-1) were shifted one column to the left. This will be

corrected so that the fluxes match those presented in Table 4-7. Finally, all fluxes indicated are fluxes out of the model cell, into Lake Calumet. The report did not explicitly provide this information in the Figure. However, it is stated in the heading for Table 4-7.

14. **Comment:** Section 4.2.5.1, Page 4-66. *The text states that the MODFLOW basic input file and block centered flow file are provided in Appendix M. However, Appendix M is labeled Groundwater Model Results. This discrepancy requires correction.*

CWM Response:

Appendix M will be labelled as the MODFLOW basic input module and module output centered flow.

15. **Comment:** Section 4.2.5.1, Page 4-66. *The report indicates that the hydraulic conductivity of the fill material varies up to four orders of magnitude, suggesting that the fill material is highly heterogeneous. It is unclear why an average value for hydraulic conductivity was assumed for the fill, particularly using a model that can easily account for heterogeneities.*

CWM Response:

As indicated earlier, average conditions were simulated. While it is a correct assumption that there are likely to be locations on the pier where the flux is slightly larger than that simulated, there are also locations where the flux is lower. Additionally, the variations in the properties of the matrix are not typically found within a 1-foot slice. If, for example, an areal simulation were performed, it would be appropriate to adjust the cell-to-cell conditions.

16. **Comment:** Section 4.2.5.1, Page 4-66. *The orientation of the model grid is confusing and requires clarification. In addition, the location of no-flow boundary and constant head cells should be specified on a figure. For example, the cross section provided in Figure 4-1 is oriented north-south. This north-south orientation conflicts with the text which states that the west and east model boundaries are oriented left and right. The discussion should be clarified, and the text or the figure revised.*

CWM Response:

The text will be corrected. The "left" and "right" boundaries are north and south, respectively. However, as the text indicates, no flow conditions are simulated on all four sides of the model; on the north and south, because those boundaries are at groundwater

divides, and on the east and west because of the orientation with groundwater flow directions.

17. **Comment:** Section 4.2.5.1, Page 4-66. *The text states that the simulated hydraulic conductivity was held constant based on field observations. This statement contradicts sections of the report that indicate the fill material is heterogeneous and anisotropic. The text should be clarified.*

CWM Response:

The report indicates that the hydraulic conductivity values were not changed during the calibration process. It makes no reference to the spatial distribution of that parameter.

18. **Comment:** Section 4.2.5.1, Page 4-66. *The report states that the hydraulic conductivity parameter was not adjusted during the process of model calibration. Adjusting the hydraulic conductivity parameter during model calibration is generally the most accepted and conventional method of model calibration, particularly for heterogeneous aquifers. A rationale for deviating from established methods for model calibration should be provided.*

CWM Response:

The conventional method of calibration is to adjust parameters for which there are the fewest data. Because hydraulic conductivity is a value for which there are typically very few data, it is frequently a parameter that is varied during the calibration process. Likewise, it is also the convention in modeling that if a parameter is well represented in the database, it should be held constant, and other, less represented parameters should be adjusted. In the case of the CWM pier, substantial field data were available for all parameters except recharge. Consequently, modeling convention indicated that calibration should be attempted by only making reasonable (based upon professional hydrogeologic judgement) modifications to the recharge parameter.

19. **Comment:** Section 4.2.5.1, Page 4-66. *No information related to model calibration is presented. Therefore it is unclear whether the model was calibrated in a generally acceptable manner. The report requires additional technical information regarding modeling calibration, including:*

- *The calibration process*
- *The calibration termination criteria*

- *The initial values and calibrated values for all model parameters*
- *A table providing calibrated model heads and field values*
- *Calculations of residuals between simulated and measured values presented in tables and plotted on a base map*
- *Results from the MODFLOW volumetric water budget including the percent discrepancy*
- *Sensitivity analysis results used to determine the key parameters and boundary conditions investigated during calibration*
- *Justification for the reasonableness of all changes in initial model parameter values due to calibration*
- *Justification for any discrepancies between the calibrated model parameters and the parameter ranges estimated in the conceptual mode.*

CWM Response:

The model presented in the November 1993 report was intended to be an approach one level of technical sophistication above the approach taken by the Agency, for purposes of refining the Agency's results. Consequently, the degree of calibration was also one level of sophistication above that taken by the Agency.

- The calibration process is described in the response to comment 18.
- The calibration criterion used was to approximate the groundwater levels observed in the field. Because fluctuations in water levels occur over time, it is not possible to arrive at an exact match, and therefore the "degree" of calibration is a subjective determination.
- The calibration approximated a vertical section through a water table surface that was drawn from discrete, areal distributed data. Consequently, there were no individual points of data to approximate; rather, a slice through a surface was approximated. That surface, along with the model approximation, will be presented on Figure 4-1.
- Please see response to previous bullet item.
- The volumetric water budget and percent discrepancy are presented at the end of the model output and will be added to Appendix M.

The simulated hydraulic conductivities are based upon extensive field data. Therefore, a sensitivity analysis of that parameter would yield results that would be of very limited use. It is proper modeling practice to select boundaries that are either observed in the field, or are at such locations that their simulation will not affect the simulation in the area of concern. It is our opinion that the selected model boundaries accomplish both of these objectives. The boundary conditions (no flow at either end of the model domain) are also based upon field observed conditions. At the most, these boundaries may shift slightly, based upon seasonal recharge variations. This would likely have a minimal effect on the discharge into Lake Calumet from the adjacent piers. It not likely, however, that it would affect the simulated fluxes from the CWM pier.

The only parameter that was adjusted during calibration was recharge. Because other parameters were based upon field observations (as was the Agency's exercise), we did not believe that adjusting those parameters was justified. Recharge, however, was not measured. Consequently, the adjustment of that parameter was appropriate.

Because our simulation used geometric mean hydraulic conductivity values, as did the conceptual model presented by the Agency, there were no such discrepancies.

20. **Comment:** Section 4.2.5.1, Page 4-66. *The text states that recharge to the model was determined to be approximately 6 inches per year. It is unclear if this value was the result of model calibration, or if it was determined by another method.*

CWM Response:

This was the result of calibration; however, in our experience, it seems to be a realistic value for the climate in the Chicago area and the type of soil conditions encountered.

21. **Comment:** Section 4.2.5.2, Page 4-67. *The text states that model output is provided in Appendix M. Appendix M contains several model input data files but does not contain model output. Model output should be provided so that the results of modeling can be technically reviewed.*

CWM Response:

The model output will be provided.

22. **Comment:** Section 4.2.5.2, Page 4-7. *The text states that Table 4-7 provides groundwater flow rates in gallons per year. In fact, Table 4-7 provides groundwater flow rates in cubic feet per day. The table should be revised.*

CWM Response:

The table is correct. The text will be modified to indicate cubic feet per day.

23. **Comment:** Section 4.2.2.5, Page 4-7. *Model results are extrapolated for 1,000 linear feet of pier. It is unclear how the loading calculations consider the variable saturated thickness of layer 1 along this distance.*

CWM Response:

The model accounts for the variable thickness of layer 1 in its calculation of groundwater flux into Lake Calumet. The loading rate is based upon concentrations as determined from laboratory analyses of groundwater samples. From these two values, a worst-case benzene discharge was calculated.

24. **Comment:** Sections 4.2.5.2 and 4.2.5.3, Page 4-67. *The text discusses benzene discharge into the lake and concludes that the actual discharge of benzene is probably very low. This conclusion was based on a groundwater model. U.S. EPA disagrees with this statement. When the number and level of Appendix IX constituents detected in the soils and groundwater are considered, the total number of hazardous contaminants discharging to the lake over time becomes quite significant. As stated below, the main purpose of performing a groundwater model was to estimate the flux of contaminants of concern into Lake Calumet. Since the groundwater model failed to accomplish this, we have estimated contaminant discharge levels at three monitoring well locations, G-314, G-330 and G-336. These three wells are located at the edge of the pier and screened in shallow groundwater which is hydraulically connected with the lake water. Based on geometric mean hydraulic conductivity data and other data obtained from the REPORT such as porosity of the fill land hydraulic gradients in the shallow groundwater, the following contaminant discharges were estimated for benzene, 1,1-DCE and vinyl chloride. These contaminants were selected based on their toxicity, migration potential and frequency of detection.*

At G-314, approximately 7.5 pounds of benzene, 25 pounds of 1,1-DCE and 16 pounds of vinyl chloride per year will be discharged to the lake through a 100-foot x 100-foot cross sectional area adjacent to G-314;

At G-330, approximately 19 pounds of benzene and 121 pounds of 1,1-DCE per year will be discharged to the lake through a 100-foot x 100-foot cross sectional area adjacent to G-330;

At G-336, approximately 72.3 pounds of benzene will be discharged to the lake per year through a 100-foot x 100-foot cross sectional area.

Therefore, the REPORT must be revised to describe these types of discharges into the lake that must be addressed in the CMS.

CWM Response:

As indicated above, the Agency's use of a 100-foot x 100-foot cross sectional area is not an appropriate means of estimating groundwater/surface interaction, due to variations in flux with distance from shore and lack of consideration of the three-dimensional aspects of site conditions. Like the Agency's approach, the model presented in the report simulated hydraulic conductivities based upon a geometric mean for each model layer. However, we considered worst-case conditions, in terms of benzene concentrations. The issue is not that benzene is the only constituent discharged; rather that the total discharge of any contaminant is likely to be an order of magnitude lower using this modeling technique, than those arrived at by the Agency's method.

25. **Comment:** Section 4.2.6, Page 4-72. *The text states that there are relatively low concentrations of organic and inorganic contaminants in the RFI wells (G-wells) in comparison to those detected in the leachate samples collected from the vault area and as such, leachate is not migrating from the vault into the lake Calumet. First, as characterized in this REPORT, the fill is the uppermost water bearing unit. Records also show that groundwater samples collected and analyzed to date come from piezometers and monitoring wells screened in the fill unit. Second, based on analytical data, groundwater samples retrieved from the fill unit through the G-wells and FG-wells show that the groundwater in the fill is contaminated. Labelling the hydropunch samples (FG) and the RFI well samples (G) provides a means of easy identification. In addition, the FG wells were installed primarily due to the lack of monitoring wells at several locations of the facility. Any attempt to differentiate the groundwater on the basis of the collection devices does not remove the fact that the groundwater in the fill is contaminated.*

Therefore, considering the number and types of contaminants detected in the groundwater samples from the FG and G wells collectively, the groundwater beneath the CWMCS facility is highly contaminated as can be demonstrated by the same modeling methodology presented in this REPORT. The effectiveness of the pier restoration work conducted in 1981 is also questionable. We also believe that the contaminants detected in wells G-336 and G-302, most likely originated from the vault due to the proximity of these wells to the vault and the mounding in the vault area. We question the integrity and effectiveness

of the vault in containing the disposed hazardous wastes from other source areas at the facility. CWMCS must revise the above statement stating that leachate is migrating from the vault. In addition, the revised REPORT should include corrective measures technologies for the vault.

CWM Response:

No attempt to differentiate between groundwater collected from the RFI wells and the Hydropunch sampling device was made. Groundwater results for samples collected from the "G-wells" (RFI wells) and the "FG-wells" (hydropunch samples) are presented in sections 4.2.1 through 4.2.5 of the Final RFI Report. Leachate samples were collected from the vault with a Hydropunch sampling device in the same manner as samples collected from the FG-wells. Leachate sample collection was performed in accordance with the approved Phase II Workplan. Liquid extracted from the vault is referred to as leachate since the vault is separated from the fill material and groundwater by a clay liner.

We disagree with U.S. EPA's contention that contaminants detected in G-302 and G-336 "likely originated from the vault due to the proximity of these wells to the vault and the mounding in the vault area." If the Agency's explanation were valid, similar conditions would be expected in samples from G-318, directly east of the vault. This well yielded fewer contaminants than the majority of the other RFI wells during both phases. Based upon flow conditions documented in the report, the contaminants found in wells G-302 and G-336 are more likely from SWMU #6 as a result of mounding at that location, and not releases from the vault.

26. **Comment:** Section 4.3.2, Page 4-104. *This sentence "The contaminant distribution pattern of the fill samples is a reflection of groundwater sample results" should be rewritten as follows: The groundwater sample results are a reflection of the contaminant distribution pattern in the soils and SWMUs at the facility. Regardless of the way this sentence is worded, it is again inconsistent with CWMCS conclusion in Section 4.2.4.*

CWM Response:

Fill sample results are similar to groundwater sample results collected during both Phases of the investigation. In both instances, organic constituents proved more useful than inorganic constituents in determining the contaminant distribution pattern. We feel that section 4.3.2 is consistent with section 4.2.4.

27. **Comment:** Section 4.4, Page 4-105. *This section asserts that onsite SWMUs have not impacted sediments in lake Calumet. There seem to be some inconsistencies in this REPORT regarding the presentation of the collected data. The text on page 4-129 states "This study did not detect any discernable immiscible or dissolved contaminant plumes*

originating from the CWMCS facility." However, on page 4-125, paragraph 4, the text acknowledged that seven PAH compounds, including elevated levels of three heavy metals were detected in the phase II sediments samples collected near the pier. The text also states that the highest concentrations were measured in sample S-1 collected immediately northeast of the biobed area. Nevertheless, based on our evaluation of the phase II sediment sample results, sample locations, leachate sample results and the Geological data, we have reached the following conclusions:

- *The occurrence of high concentrations of pyrene and fluoranthene in the leachate samples from the vault and their detection in samples S-6 and S-10 collected from close proximity to the vault makes the vault the most likely source of these contaminants.*
- *That the most likely sources of contaminants detected in sediment samples S-1 are the onsite biobeds due to the samples location and the groundwater flow regime created by the mounding in the biobed area. By definition, the sediment samples collected from the S-1 locations, is hazardous waste F039 and the concentrations of the associated hazardous constituents Benzo(b) fluoranthene, Benzo(k) fluoranthene, Phenanthrene, Pyrene and Fluoranthene detected in the sediment samples, exceed the regulatory threshold set in 40 CFR 268.43.*
- *CWMCS has failed to prove that the origin of the contaminants detected in the lake sediments collected from locations close to the pier are from other sources other than the onsite SWMUs.*

CWM Response:

We feel that our conclusion stating that "This study did not detect any discernable immiscible or dissolved contaminant plumes originating from the CWMCS facility" remains valid for the following reasons:

The detection of fluoranthene and pyrene detected in sediment samples collected from S-6 and S-10 does not indicate a release from the vault. Both constituents were detected in leachate samples, but were not detected in groundwater samples collected from RFI wells G-302, G-318, or G-336. (Well G-336 is south of the vault between the vault and the S-6 sample location. Well G-302 and S-10 are both located north of the vault).

The Agency has concluded that the reported concentrations of pyrene and fluoranthene in the S-6 and S-10 sediment samples collected from Lake Calumet, indicate that the vault is the likely source of these constituents. There is absolutely no inconsistency with the RFIs conclusion that some PAH compound are present in the sediments and its conclusion that there is no evidence of immiscible or dissolved contaminate plumes originating from the CWMCS facility. These constituents were reported in the majority

of sediment samples collected during Phase I of the RFI, including those samples which were obtained from the middle of Lake Calumet, furthest from the facility.

Additional information published by the Agency need also be considered in evaluating the presence of fluoranthene and pyrene in the Lake Calumet sediments. As stated in the Agency's Sediment Quality Criteria document (See 59 Federal Register 2652, January 18, 1994),

"Fluoranthene, a polycyclic aromatic hydrocarbon, is a combustion product produced by the pyrolysis of organic raw materials, such as coal and petroleum at high temperature. It is ubiquitous in the environment." (Emphasis added)

Also, in adopting the Agency's stormwater control regulations, and ultimately, its Multi-Sector Stormwater General Permit (58 Federal Register 61146, November 19, 1993), U.S.EPA provided "funding and guidance" to the Nationwide Urban Runoff Program (NURP) to study the nature of precipitation run-off from commercial and residential areas. Through this study, NURP found seventy-seven priority pollutants which were typically found in stormwater discharges, with fluoranthene and pyrene amongst the most frequently detected compounds (See 58 Federal Register 61146, 61153-4, November 19, 1993). In the same notice, the general stormwater permit for Primary Metals Facilities contains data which shows that pyrene has been recently detected in discharges from the Primary Metal manufacturing facilities, such as iron and steel manufacturing facilities (See 58 Federal Register 61146, 61223-61228, November 19, 1993). The area surrounding Lake Calumet has historically had one of the highest concentrations of primary metal manufacturing facilities of any area in the country.

Based upon the data presented in the RFI Report and on the information presented above, it is much more likely to conclude that the presence of fluoranthene and pyrene in the Lake Calumet sediments is attributable to historical industrial activities and precipitation run-off than from the percolation of precipitation through solid waste management units at the facility and into Lake Calumet.

U.S.EPA similarly attributes the contaminants detected in sediment sample S-1 (Phase II), to the biobeds. As CWMCS noted in the RFI Work Plan, Hyon Inc. experienced flooding problems with the biobeds during their operation and was repeatedly cited by the Metropolitan Sanitary District of Greater Chicago and the City of Chicago for its failure to adequately control water levels in that area. The presence of the constituents reported in the sediments from sample S-1 are most likely due to precipitation run-off, the industrial activities in the Lake Calumet area, leachate runoff from adjacent sanitary landfills, and the depositional and flow patterns in Lake Calumet, rather than from percolation through wastes.

U.S.EPA also concludes that the sediments in Lake Calumet are by definition, a "hazardous waste F039". It is important to note that this position is inaccurate from both

a technical as well as a regulatory perspective. For a material to be classified as a RCRA hazardous waste, as defined in 40 Code of Federal Regulations (CFR) Part 261, that material must first meet the definition of a "solid waste" prior to determining if the material would be categorized as a hazardous waste. It is the opinion of CWM, that the Lake Calumet sediments are a naturally occurring resource which does not meet the definition of "solid waste" under RCRA.

Even if the Lake Calumet sediments were to be defined as a RCRA solid waste, the sediments would not be categorized as a hazardous waste under the requirements of RCRA. The requirements of 40 CFR 262.1 specify that a generator of a waste must determine if a material is either a listed and/or a characteristic hazardous waste. No analytical data has been obtained from direct testing of the sediments samples for possible characterization as a hazardous waste. In addition, analytical testing cannot make a determination of whether a solid waste is a listed waste. Clearly, pursuant to the definitions of a hazardous waste in 40 CFR Part 261, the sediments would not meet the definition of a listed hazardous waste.

The regulatory standards for multi-source leachate (F039), are inappropriately applied by the Agency. "Leachate" is defined in the hazardous waste regulations as "any liquid, including any suspended components in the liquid, that has percolated through hazardous waste." U.S.EPA's waste code for multi-source leachate was adopted in response to objections by a number of parties to the Agency's announcement of the "waste code carry-through principle" when the First Third of scheduled wastes land disposal restriction regulations were adopted. (See 53 Federal Register 31138, 31148, August 17, 1988). U.S.EPA's interpretation of the "carry-through principle" was in turn based on its interpretation of the "mixture" and "derived - from" rules, which are set forth in 40 CFR 261.3. While the derived from rule refers to leachate, it specifically excludes precipitation run-off:

(c) Unless and until it meets the criteria of paragraph (d) of this section:

(1) a hazardous waste will remain a hazardous waste.

(2)(i) Except as otherwise provided in paragraph (c)(2)(ii) of this section, any solid waste generated from the treatment, storage, disposal or a hazardous waste, including any sludge, spill residue, ash, emission control dust or leachate (but not including precipitation run-off) is a hazardous waste....(Emphasis added)

The Agency's theory apparently is that a hydraulic connection between the fill upon which the CWMCS facility is located and Lake Calumet renders the Lake Calumet sediments a hazardous waste. By this logic, Lake Calumet itself would be characterized

as F039 as would all water bodies connecting to the Lake Calumet including Lake Michigan.

The compounds detected in the sediments of Lake Calumet during the RFI study, in all likelihood, are present in Lake Calumet in a number of locations. There is also little doubt, when all of the data are considered, that the source of these contaminants is not leachate from solid waste management units at the facility, but from other factors, such as precipitation run-off from the surrounding, heavily industrialized area.

U.S.EPA apparently believes that the presence of Benzo(b)fluoranthene, Benzo(k)fluoranthene, Phenanthrene, Pyrene, and Fluoranthene, in concentrations above the F039 treatment standards contained in 40 CFR 268.43 has some significance. First, neither the sediments nor the Lake Calumet water meet the regulatory definition of leachate, so assignment of an F039 waste code with its associated treatment standards is inappropriate. Second, even if the sediment could conceivably be classified as F039 (which as discussed above, CWM believes that it is not) and even if it contained concentrations of contaminants in excess of the treatment standards contained in 40 CFR 268.43, the sediments would not need to be removed, or otherwise managed, absent some demonstrated threat to human health or the environment.

The USEPA fails to recognize historic land use and waste disposal practices in the Lake Calumet area. Studies completed by the Hazardous Waste Research and Information Center of the Illinois State Water Survey Division concluded that a major source of PAH compounds in the Lake Calumet sediment comes from emissions from internal combustion engines. This explains the elevated levels of PAH compounds detected in sediment samples collected from near the Calumet Expressway (west side of Lake Calumet). Lake sediment scouring and deposition was also included in this study. The study concluded that resuspension of bottom materials is a significant source of pollutants and that it is an important mechanism of pollutant transport in Lake Calumet.

PAH compounds were detected at the S-1, S-6, and S-10 locations, as well as samples collected from virtually all lake sediment sample locations. This does not indicate that the CWMCS facility is the source of PAH contamination of Lake Calumet sediments. PAH contamination in Lake Calumet near the facility is best explained by the fact that the prevailing winds are from the west/southwest, the major source of PAH compounds are from the west, the shallow lake is prone to scouring, and that resuspension and deposition of sediments by wave action is transporting PAH contaminated sediments to the eastern/northeastern portion of the lake.

28. *Comment: Section 5.3, Page 5-3. The text indicates that there are no risks from Lake Calumet to recreational users (dermal absorption and incidental ingestion) and from fish ingestion. We disagree with this statement. It has been documented in this REPORT that the groundwater in the fill is highly contaminated and the majority of the hazardous constituents in the groundwater are expected to be released to the lake. Exposure due*

to fish ingestion and to recreational users must be included in the risk assessment. U.S. EPA had-raised some concern regarding the number of dead gulls observed on the western half of the pier. Ingesting small quantities of soils containing potentially toxic hazardous constituents could be fatal. Therefore, the revised REPORT must address remedial technologies in the CMS to prevent further releases to the lake.

CWM Response:

The text does not indicate that there are no risks from Lake Calumet to recreational users (dermal absorption or incidental ingestion) and from fish ingestion. The text is clear in that these pathways are not viable since the lake is not a swimming facility nor is it used as a drinking water supply. Modifications to the risk assessment (inclusion due to fish ingestion and to recreational uses) are discussed in the responses to USEPA's comments on Part III of Final RFI Report. (Section 5.3 states that the results of historic contamination to the lake makes quantification of risk from fish ingestion impossible.)

The pier area is the nesting area for literally thousands of gulls. U.S. EPA indicates that the average annual herring gull (*larus argentatus*) mortality rate is significant and has been reported as 8, 22, and 7.3 percent in different locations (U.S. Environmental Protection Agency (1993), Wildlife Exposure Factors Handbook, Volume I of II, EPA/6--/R-93/187a). It could easily be expected that hundreds of dead gulls, in various states of decay, would be on the pier at any time.

There is no basis for the Agency's association of dead gulls with hazardous constituents. This implied relationship is unsubstantiated.

PART 2

1. **Comment:** Section 1.1, Pages 1-1. *This section discusses the evaluation of applicable corrective measures technologies for the facility. However, there appears to be no connection between the need for corrective measures and the findings of the RFI. There was no mention in the REPORT of the threat that contaminants detected at the facility pose to public health or the environment that caused CWMCS to evaluate these applicable remedial technologies. This information gap must be addressed in the revised REPORT by linking potential threats posed by the facility with the corrective measures technologies that are being evaluated. The results of the risk assessment are already available and should be incorporated into the final RFI report.*

CWM Response:

As stated in Task IV of the RCRA Corrective Action Plan for the facility:

" In the event that a release that presents a threat to public health or the environment is detected during the facility investigation, SCA shall submit to the U.S. EPA a report that identifies the potential corrective measure technologies that may be used on-site or off-site for the containment, treatment or remediation, and/or disposal of contamination."

We feel that this section is adequate in meeting the obligation of Task IV of the RCRA Corrective Action Plan. Threats to public health and the environment are not presented in Part I or II of the report since they are presented in the Human Health Risk Assessment and Ecological Risk Assessment portions of the Final RFI Report.

2. **Comment:** Section 2, Pages 2-8. *This section presents applicable corrective measures technologies for the facility. The evaluation of corrective measures technologies presented in Part 2 of the report appears to be appropriate as a preliminary evaluation. However, the following are missing from this section, and should be addressed in the revised REPORT:*
 - *The rationale and the need for evaluating corrective measures technologies in light of the results of the RFI and the risk assessment*
 - *Data needed to evaluate corrective measures technologies as required under Task IV of the CAP*
 - *Option to retain the no-action alternative for comparison with other alternatives*

- *Evaluation of a cap that would comply with RCRA requirements based on the types and concentrations of contaminants found at the source areas*
- *Metals treatment technologies, such as precipitation, coagulation, and sedimentation, because metals may need to be removed from groundwater prior to discharge*
- *Soil treatment technologies option for hot spot remediation, especially at SWMUs 1, 4, and 6, and the Hyon Tank Farm to reduce continued contaminant loading to the groundwater*
- *Consideration of alternative thermal treatment technologies to incineration since the facility's incinerator currently does not have a permit to operate*

CWM Response:

We feel that the issues listed in the above comment should not be included in Part II of the RFI Report. Instead these issues should be addressed in the Corrective Measures Study. As stated in Section 3.0, Part II of the RFI report " A detailed evaluation of all corrective measures, including projected costs and subsequent environmental impacts of each, will be the focus of the Corrective Measures Study". The Corrective Measures Study will include Tasks VIII, IX, X, and XI of the RCRA Corrective Action Plan.

Part 3

1. **Comment:** Section 2.2, Page 2-1. *The text seems to imply that this RFI was an attempt to evaluate the scope of contamination in the entire Lake Calumet Region and CWMCS contribution to these releases into the lake. We believe that CWMCS understanding of the scope/objective of this RFI is overly broad and unrealistic. The purpose of this RFI is to determine the nature and extent of releases of hazardous waste or hazardous constituents from the regulated units, SWMUs and other source areas at the CWMCS facility and to gather all necessary data to support a CMS and if necessary to remedy these releases. We believe that it is necessary and practical to restore this damaged area to original condition or as close as possible, regardless of the size and the position it occupies in the region.*

CWM Response:

Facility environmental investigations require consideration of issues beyond the facility boundaries. Consideration of the potential impacts from local landfills and 100 years of industrial activity within the Lake Calumet area are necessary to determine impacts of these activities on the facility.

The Agency's conclusion that "it is necessary and practical to restore this damaged area to original condition or as close as possible" is irresponsible and unsupported by a technical justification at this time, particularly without the benefit of a CMS.

2. **Comment:** Section 2.3, Page 2-9. *The text implies that Preliminary Remediation Goals (PRGs) are not based on human health effects associated with use of this groundwater as a drinking water source or for domestic or Agricultural purposes. Task V of the CAP requires that all relevant and applicable standards for protection of human health and the environment, including federal and state standards, be identified. Although this section addresses groundwater protection standards and alternate concentration limits, other applicable standards such as those pertaining to protection of on-site workers that could come in contact with contaminated soils (surface & subsurface) and groundwater, should be identified in this section. The CMS must consider in addition to other protection standards, soil cleanup levels that are protective of the groundwater quality standards found in 35, IAC Subpart B, Sections 620.10 and 620.20. Remediation of contaminated soils at the CWMCS facility must ensure that these standards are fully satisfied.*

The text also concluded that PRGs for groundwater to ensure the protection of aquatic life are not necessary because contaminant levels in surface water and sediments will not increase over time, that potential current impacts on aquatic life are also assumed to be representative of potential future impacts. If the above statement and assumption were true, CWMCS must provide the rationale for evaluating risk to current ecological

receptors in the lake, in the Ecological Risk Assessment. We recommend that the revised RFI report must include the following:

- Title 35, IAC Subpart B, 620.420 class II groundwater protection standard;
- PRGs for groundwater to ensure protection for onsite remediation workers;
- PRGs for groundwater to ensure protection of aquatic life.
- PRGs for soils to ensure protection of onsite workers and groundwater.

CWM Response:

The CWMCS facility has received a determination from the Illinois Environmental Protection Agency (IEPA) which indicates that the groundwater within the fill and the top ten feet of parent material beneath the fill are considered to be a Class II: General Resource Groundwater. The standards for Class II groundwater, as specified in 35 LAC 620.420, will be compared to the analytical results obtained from the post-closure monitoring program for the closed interim status surface impoundments at the facility.

The groundwater quality standards in 35 LAC Subpart B, Section 620.410 are applicable to Class I portable resource groundwaters only. These requirements and standards are not applicable to the groundwater within the fill material at the CWMCS facility, based upon the definition of a Class I groundwater and the IEPA's determination that the groundwater at the facility is a Class II groundwater.

CWMCS has stated in this section of the RFI Report, that "Potential risks to current ecological receptors known or suspected to occur in Lake Calumet near the CWMCS pier have been quantitatively evaluated in the Ecological Risk Assessment (ERA) prepared for this site." Potential Practical Remediation Goals (PRGs) are required to Task 5 of the Corrective Action Plan for the facility. These PRGs will be defined in the Corrective Action Plan and will be based on the protection of aquatic life.

3. **Comment:** Appendix K, General. *This appendix cannot be readily used because it lacks the data qualifiers discussed in Appendix N.*

CWM Response:

The analytical data presented in Appendix K provides a summary of the analytical results obtained from the laboratory prior to data validation. The validated data, as presented in the text of the RFI Report and as utilized for the Human Health and Ecological Risk Assessments, is provided in Appendix N.

4. **Comment:** Appendix N. General. *As presented, it is practically impossible for a user to locate the qualifiers associated with the group of data used to estimate exposure point concentrations. Therefore, this appendix should have a table of contents which includes the type of the samples analyzed during both RFI phases and the data validation and quality assurance review for each sample analyzed.*

CWM Response:

Appendix N has been segregated into Phase I and Phase I Data Validation Reports. The types of samples analyzed during each Phase of the RFI have been specified in both the RFI Phase I and II Work Plans and the RFI Report itself. Table I of each validation report presents the sample identification for each report, with each report separated by a colored sheet of paper.

The reports have been prepared and presented in this format based upon the methodology used to validate the data. Groups of data which were analyzed together were reviewed together to eliminate repetitiveness in the review and reporting process.

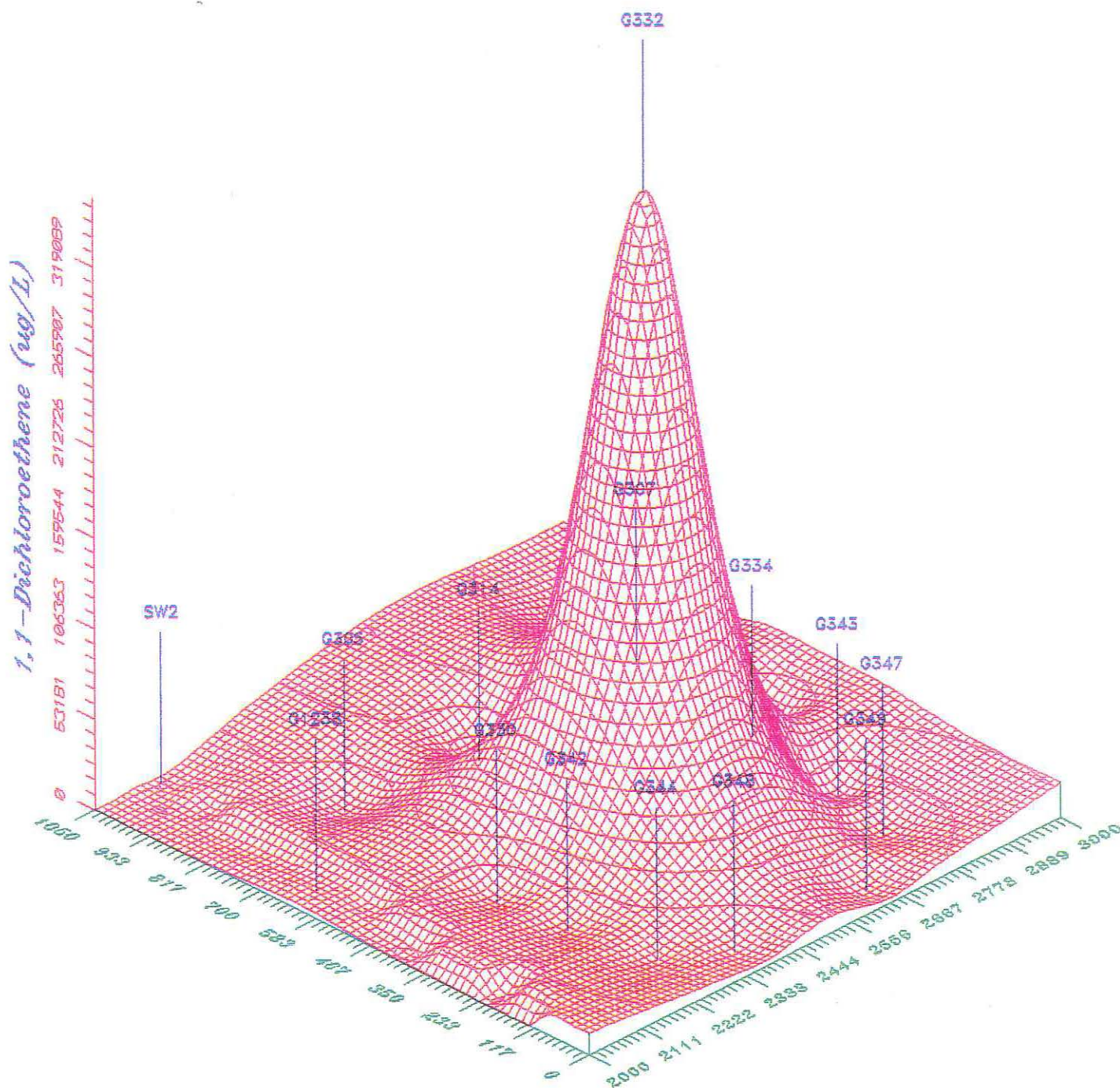
ATTACHMENT I

THREE DIMENSIONAL ISOCONCENTRATION MAPS

Comment Section 4.2.4, Page 4-62

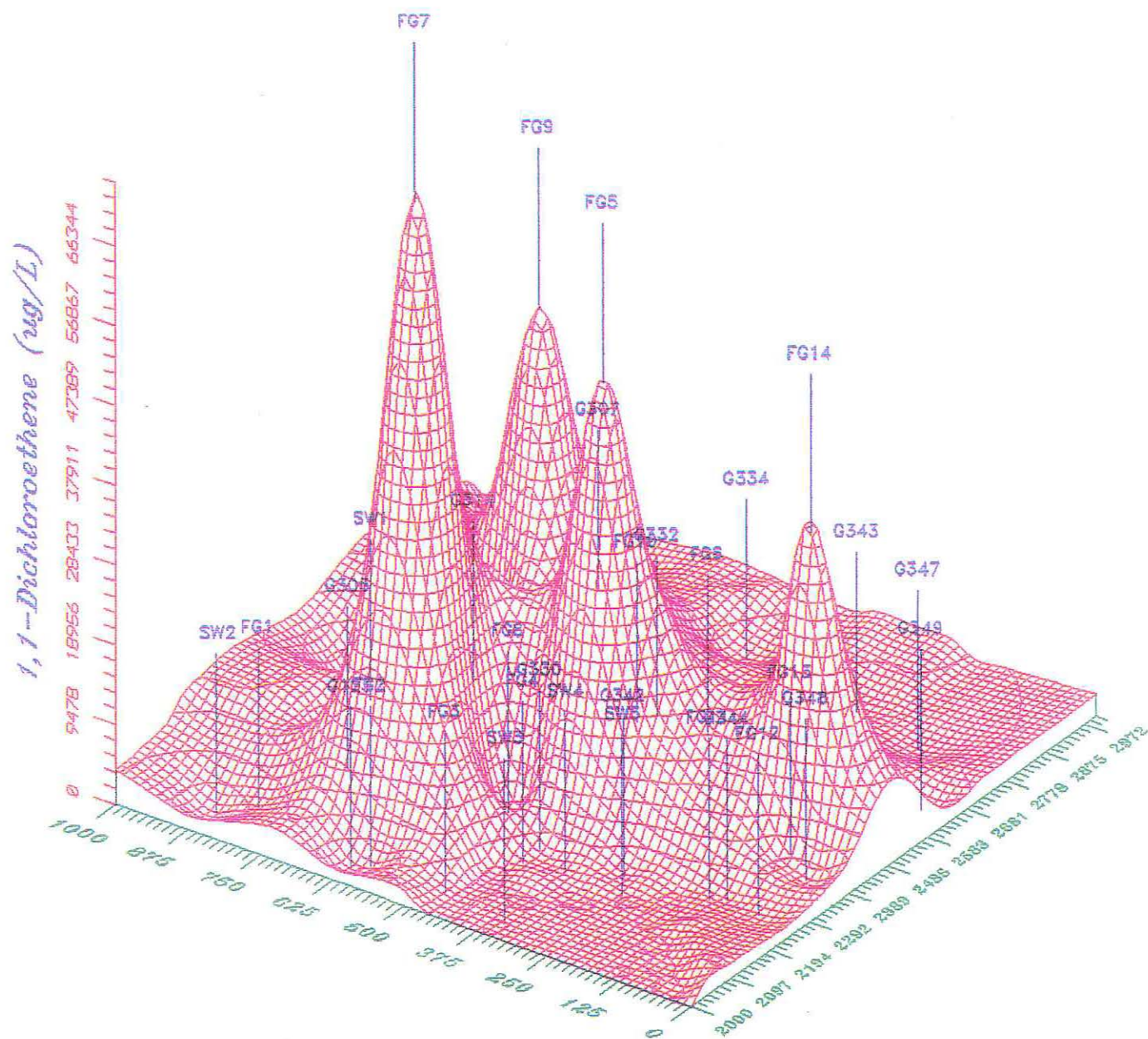
PHASE 1 GROUNDWATER VOLATILES

Chemical Waste Management - Chicago



PHASE II GROUNDWATER VOLATILES

Chemical Waste Management - Chicago





ATTACHMENT 2

ATTACHMENT II

RESPONSE TO TECHNICAL REVIEW OF
CHEMICAL WASTE MANAGEMENT CHEMICAL SERVICES, INC. (CWMCS)
CHICAGO INCINERATOR FACILITY
FINAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
FACILITY INVESTIGATION (RFI) REPORT
APPENDIX O -- RFI BASELINE HUMAN HEALTH RISK ASSESSMENT

GENERAL COMMENTS

1. **Comment:** The baseline human health risk assessment (RA) does not evaluate a residential land use scenario and the various exposures that may result to human receptors. EPA never approved eliminating this scenario from the RA. Therefore, the RA should be revised to evaluate the residential land use scenario.

CWM Response: On September 29, 1992 a meeting was held with Mr. Jonathan Adenuga, U.S.EPA. One of the issues discussed was the future use scenario to be addressed in the risk assessment. As a result of this meeting, a letter dated October 16, 1992 was furnished to the U.S.EPA discussing factors which made a future residential use scenario improbable. U.S.EPA responded by letter dated October 29, 1992 stating: "Finally, we believe that future land use scenario should be included in the "risk assessment" and U.S.EPA reserves the right to evaluate this scenario independently and to consider the result in our final decision." It is CWMCS's opinion that resolution of this issue was included in the Agency's October 29, 1992 letter.

2. **Comment:** The RA states that exposures involving persons ingesting fish were not calculated because of the difficulty in separating the facility's contribution to Lake Calumet contamination from the contributions of numerous other sources. However, it is possible to model the flux of contaminants entering Lake Calumet from the facility, and to subsequently model the uptake of these contaminants into aquatic life and into human receptors that ingest the aquatic

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life. For example, Section 4 of the RA presents a model used to estimate the flux of contaminants from the facility into Lake Calumet. Therefore, the RA should be revised to (1) model the flux of contaminants from the facility entering Lake Calumet, (2) model the resulting concentrations of these contaminants in aquatic life in Lake Calumet, and (3) subsequently calculate exposures and risks to human receptors ingesting this aquatic life.

CWM Response: PRC Environmental Management prepared the following document at the request of U.S.EPA: CWMCS SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT TECHNICAL REVIEW. Subsistence Fishermen, Section 3.1.1 of the document states:

"Fishermen have been observed fishing in Lake Calumet near the CWMCS Incinerator facility. These fishermen may come in contact with contaminated sediments while standing on the edge of the lake or as a result of wading into the lake. These receptors may also be exposed to contaminated surface water. **This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993). Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties"** (emphasis added).

The Agency approved workplan for the investigation relied on the sampling of Lake Calumet water and sediments. Approximately one year was required by the Agency to review and approve the analytical laboratories QA/QC program and to further ensure the integrity of the data, the Agency required that the data be validated.

Modelling the flux of material from the pier into Lake Calumet has significant uncertainty. Agency Guidelines for Exposure Assessment, 57 FR 22888, provides the following comment under Section 5.1.4 COMBINING MEASUREMENT DATA AND MODELING RESULTS, "...measurement data are often used within the context of the model itself, as calibration and verification points, or as a check on the plausibility of the model results." To validate the model, the flux calculations would be compared to the analytical data obtained during the investigation. Revision of the RA to include flux estimates, which have a high level of uncertainty, is not warranted. Based upon a review of

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analytical data, PRC concluded in their Supplemental Risk document that "very little contamination was detected in surface water". Relying upon modelling estimates in the face of contrary empirical data is a specious argument.

3. **Comment:** The RA does not evaluate exposure of facility construction and remediation workers to subsurface contaminated soils and shallow groundwater. The RA does not evaluate exposure of recreational users to near-shore contaminated sediments. The RA should be revised to estimate the exposures to these receptors and the associated risks.

CWM Response: At U.S.EPA's request PRC Environmental Management Inc. (PRC) prepared a document entitled: CWMCS SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT TECHNICAL REVIEW. The document addresses human health risk to Subsistence Fishermen and Construction/Utility Workers.

The Agency is correct in concluding that risk was not calculated for facility construction and remediation worker exposure to subsurface contaminated soils and shallow groundwater. In the Supplemental Risk document, PRC assumed that a construction worker's hands and feet would be exposed to groundwater. The exposure frequency was calculated on the basis of 15 days per year in each of three (3) areas; 45 days per year, for a period of 25 years. For these calculations to be valid, the Occupational Safety and Health Administrations regulations would have to be willfully violated. PPE requirements would apply, thus mitigating if not eliminating any exposure to groundwater. The RA must evaluate scenarios within the structure of current applicable regulations. See the response to Attachment II, General Comment #6 for further information.

Dames and Moore concluded that due to a lack of recreational users, the recreational pathway is not viable. However, PRC evaluated the exposure of subsistence fishermen to sediments at two locations adjacent to the pier. The assumed exposure frequency was 160 days per year (7 days/week for June through August; 5 days /week for May and September; and 3 days/week for April and October), for an exposure duration of 30 years. These assumptions would be ultra conservative for calculating a recreational user's exposure to sediment in the two limited areas identified by PRC. Accepting PRC's data, the noncarcinogenic risk for subsistence fishermen ranges from $2.5E-05$ to $3.7E-05$. Carcinogenic Risks range from $6E-08$ to $7E-07$. It is concluded that the subsistence fishermen scenario selected by PRC is more conservative than a recreational use scenario, yet the health risks under even these extreme exposure assumptions are lower than the lower

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bound of EPA's acceptable risk range.

4. **Comment:** The RA uses analytical results for soil samples collected from a subsurface clay layer beneath the facility to represent background soil concentrations. However, two problems exist with the approach taken. Figure 2-1 in the RA shows that three surface soil samples (SS-11, SS-12, and SS-13) were collected from an undeveloped pier north of the facility. Presumably these samples were originally collected to represent background conditions. The RA should be revised to provide a comprehensive discussion of why these surface soil samples were not retained as background samples. The RA should be revised to explain how the clay sampling locations were selected and should demonstrate that the clay samples represent facility-wide conditions.

CWM Response: Surface soil samples SS-11, SS-12 and SS-13 were originally identified as background samples. As described in the REPORT, the facility is constructed upon fill material imported to the facility. Adjacent piers were also constructed of fill material consisting of construction rubble and other unclassified materials from unknown sources. None of these surficial soils are naturally occurring, and may have originated from different sources over a period of time. During the investigation, it was determined that Lake Calumet sediment depth was approximately 6 inches. Immediately beneath the sediment layer is the upper lacustrine unit which is a natural deposit. For these reasons, the naturally occurring "clay" layer was considered to be more representative of background conditions than imported fill material on an adjacent pier.

5. **Comment (First Half):** Statistical procedures and the results of these procedures are not presented clearly in the RA. The discussion of statistical procedures and their results should be revised to include (1) examples of the equations used and (2) critical statistical values (such as t-critical) to which calculated values were compared to determine their significance.

CWM Response: This information is currently being prepared and will be submitted as soon as it becomes available.

Comment (Second Half): Furthermore, as discussed in specific comments regarding Section 3.0, the RA should be revised to include two exposure areas: (1) the area within the fence and (2) the rest of the facility. Finally, the discussion of (1)

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statistical procedures and (2) the selection of chemicals of potential concern (COPC) should be revised accordingly.

CWM Response: At U.S.EPA's request PRC Environmental Management Inc. (PRC) prepared a document entitled: CWMCS SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT TECHNICAL REVIEW. The individuals preparing the document relied upon their professional judgement and assessed the facility on the basis of three (3) areas: Area A, Area B and Area C. This is inconsistent with the Agency's comment. The RA prepared by Dames and Moore relied upon the professional judgement of their risk assessor. The Agency's comment has been considered and the exposure assumptions will remain as presented in the RA.

As necessary, the discussion of statistical procedures will be revised for clarity.

6. **Comment:** In evaluating the future industrial scenario, the RA assumes that work practices will continue unchanged. Also, the worker exposure scenarios rely heavily on administrative controls such as required clothing. The RA should be revised to (1) consider future changes in work patterns, such as increased inspection frequencies or relocation of work areas, that may result in increased exposure and (2) consider exposure that may result if workers fail to adhere to administrative controls such as personal protective equipment requirements; this would be the case at a typical construction site.

CWM Response: There are four recognized types of control measures (administrative, engineering, personal protective equipment, and training). Each involves some degree of administrative involvement. Personal protective equipment (PPE) is a distinct entity unto itself and is not an administrative control. Administrative controls are passive control measures that can be undertaken to reduce worker exposure. Familiar examples include changing production schedules, and transferring or rotating workers out of an exposed area to a lower exposure area so that individual exposures are within safe limits. (National Safety Council, 1979, p. 258) In contrast, engineering controls reduce worker exposure "...by modifying the source or reducing the quantity of contaminants released into the workroom environment." (National Safety Council, 1979, p. 1185) Personal protective equipment does not directly remove the worker from the hazardous environment, nor does it modify the source or reduce the quantity of contaminants in the work environment. PPE

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protects a worker by introducing a physical barrier between the worker and harmful chemical or physical agents, or energies.

Also, while ownership and work practices may change in a future industrial use scenario, it is important to recognize that Occupational Safety and Health Administration (OSHA) regulations also play a substantial role in protecting workers, both current and future. The U.S. OSHA has promulgated three rules relevant to the situation at CWMCS. First, with the assistance of U.S. EPA, OSHA promulgated a rule governing hazardous waste operations (including operations involving hazardous wastes at RCRA-regulated sites and clean-up at uncontrolled hazardous waste (e.g., Superfund) sites), and emergency response operations (29 CFR §1910.120). Second, OSHA promulgated a rule revising the health standards applicable to the construction industry (29 CFR §1926) by incorporating general industry safety and health standards, including those applying to hazardous waste operations and emergency response. Third, OSHA recently promulgated a rule revising its general industry standards for PPE. (Occupational Safety and Health Administration, 1994) The rule requires employers to perform a hazard assessment of workplace hazards that necessitate the use of PPE. If such a hazard is or may be present, the employer must select PPE that will protect each affected employee from the hazard(s), prepare a written certification of the hazard assessment, and train employees on various elements of the PPE.

Thus, the scenario the Agency suggests in its comments above, is more than a failure of administrative controls, it is a major administrative (and possibly even a criminal) violation of OSHA regulations. The existence of well-defined OSHA health and safety regulations that would prohibit such actions dramatically lowers the likelihood of this exposure scenario. Therefore, no revisions to the HHRA are warranted.

7. **Comment:** The RA apparently includes analytical results for soil samples collected during more than one sample round. For example, the table in Appendix A presenting clay sample results states that the clay samples were collected in Phase II. The RA should be revised to specify all sample analytical data evaluated for the RA.

CWM Response: All available, validated, analytical data was evaluated for the Human Health Risk Assessment. The analytical results from the Phase I clay samples were not used in the evaluations due to problems encountered during the collection of these samples which rendered the results

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invalid.

8. **Comment:** The reference section of the RA should be revised to present references by the same author in chronological order.

CWM Response: Given the number and extent of comments received, this is a minor consideration. A chronological listing will be provided if time permits.

9. **Comment:** All tables in the RA should be revised as necessary to reflect changes made to the text based on the comments herein.

CWM Response: Agreed.

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SPECIFIC COMMENTS

1. **Comment:** Section 1.1, Page 1-2, Paragraph 1. The third sentence states the "The Hyon operation was to include the incineration of liquid and hazardous wastes and the neutralization and biological treatment of aqueous hazardous waste." The RA should be revised to clearly state whether these wastes were in fact incinerated, neutralized, or treated.

CWM Response: The text further indicates (Section 1.1, Page 1-2, Paragraph 1) "About 10% of this waste was incinerated while the remainder was treated." This is the best information available.

2. **Comment:** Section 1.1, Page 1-2, Paragraph 2. This paragraph states that excavated basins were backfilled and covered with "innocuous" fill. The term "innocuous" is judgmental and can be interpreted in various ways. The RA should be revised to (1) explain how the fill was judged to be innocuous and (2) specify the source of the fill and the results of any testing

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conducted on the fill.

CWM Response: The material used to fill the excavations was not waste nor was the fill stabilized waste materials. The term "clean" fill could have been used but similar questions would have been raised. The sources of the fill material is believed to have been offsite, and it is unknown if testing was performed. The REPORT details the investigation of the former SWMUs and defines the testing conducted within the individual areas.

3. **Comment:** Section 1.1, Figure 1-1. The southeast boundary of the facility is defined as the "Southern boundary of the present SCA facility." Section 1.2 states that CWMCS took over facility operations in 1985. Therefore, Figure 1-1 should be revised to refer to the present CWMCS facility.

CWM Response: The title block on Figure 1-1 indicates that the facility is CWM Chemical Services, Inc. Chicago Incinerator and the title of the Figure is "Hyon SWMU's". The Figure correctly indicates the location of the Hyon SWMU's and the property line reference carried over from an original base map. The text adequately describes the relationship of SCA to CWM Chemical Services. On this basis revising the Figure for this minor detail does not appear to be warranted.

4. **Comment:** Section 2.0, Page 2-1, Paragraph 1. Fishing in Lake Calumet is not addressed. Since the lake is fished, COPCs for surface water and sediment should be specified in the RA. Estimates of the facility's loadings to Lake Calumet should be derived from the model presented in the November 1993 final RFI report.

CWM Response: COPCs for surface water and sediment were identified in Appendix P, Ecological Risk Assessment, of the REPORT. Further, Section 3.1.3, Page 3-4 discusses the uncertainty associated with assessing ingestion of fish.

At U.S.EPA's request PRC Environmental Management Inc. (PRC) prepared a document entitled: CWMCS SUPPLEMENTAL HUMAN HEALTH RISK ASSESSMENT TECHNICAL REVIEW. PRC addresses the issue of fish ingestion in Section 3.1.1 of this report through the following:

"Fishermen have been observed fishing in Lake Calumet near the CWMCS Incinerator facility.. These fishermen may come in contact with contaminated sediments while standing on the edge of the lake or as a result of wading into the lake. These receptors may also be exposed to

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contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993). Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties.

We agree with PRC that modeling the transfer of contamination from sediments would have a high level of uncertainty. The same condition applies with modelling the release of constituents from the pier. It must be noted that the Agency recommendation to use the model presented in the 1993 final RFI Report (REPORT) may be problematic in that two pages of comments have been received from the Agency on the model.

5. **Comment: Section 2.0, All.** Appendix A, which contains sample analytical data used to determine the COPCs, is not referenced in Section 2.0. Section 2.0 should be revised to include references to Appendix A where appropriate.

CWM Response: A reference to Appendix A will be added after the first sentence of the first paragraph on page 2-4. The revised text will read: "Metals detected in the surface soil samples collected during Phase II of the RFI include: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. Arsenic, beryllium, cadmium, chromium, copper, lead, nickel, silver, and zinc were detected in all 20 facility surface soil samples. A summary of metals levels in surface soils samples collected facility-wide is included in Appendix A."

Similarly, a reference to Appendix A will be added after the first sentence of the first paragraph on page 2-5. The revised text will read: "... and trichloroethylene (TCE). A summary of organic levels in surface soil samples collected facility-wide is included in Appendix A."

6. **Comment: Section 2.0, Page 2-1, Paragraph 2** First, the text states that validated analytical data packages were used to derive numerical values for data points listed as below method detection limit (BMDL) or not detected (ND). Next, the text states that analytical results reported as BMDL were not validated or used in the RA. These statements are contradictory. This paragraph also states that sample analytical results listed as BMDL and ND were assumed to equal

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one-half the sample quantitation limit. This suggests that the assumed values of these data points were used in the RA, which further suggests that the statement that analytical results presented as BMDL were not validated is incorrect. The validation and use of data listed as BMDL or ND in the RA should be clearly and consistently described. Also validation of all data should be conducted.

CWM Response: Analytical results reported as Below Method Detection Limit (BMDL), were not validated as these results become invalid during the data validation procedure due to the inability of the method to quantify, with adequate quality assurance, the reported number. Therefore, results reported as BMDL are treated as ND values. Numerical values for these samples were obtained from the analytical data packages and were derived through use of one half of the sample quantitation limits.

7. **Comment:** Section 2.0, Page 2-2, Paragraph O. The text states that compounds with detection frequencies of 5 percent or less were eliminated from consideration. The rationale for eliminating these compounds should be provided. In formulating a rationale for exclusion of compounds the following should be considered: facility activities, contaminant concentrations, toxicity, mobility, and persistence; special exposure routes; treatability; and applicable or relevant and appropriate requirements (ARAR).

CWM Response: As detailed in Section 2.0 of the Human Health Risk Assessment (HHRA), three criteria were used in the selection of chemicals of potential concern (COPCs). One criterion was to eliminate chemicals found in 5 percent or less of facility-related samples. However, no chemicals were eliminated based on this low frequency of detection criterion. The text will be revised.

- 8 **Comment:** Section 2.0, Page 2-2, Paragraph 2. The collection locations of the clay samples used to determine the background concentrations of the COPCs are not provided. The collection locations of the background clay samples should be shown in Figure 2-1, and the rationale for choosing these locations should be provided. In addition, clay samples are generally not appropriate background samples to compare with surface soil samples because the clay and surface soil (fill) represent different geologic materials. Section 2.0 should be revised to provide a more comprehensive justification for the use of clay samples as representing background conditions. This revised discussion should also address why three off-facility surface soil samples (SS-11, SS-12 and SS-13)

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apparently collected as background samples were not used to represent background conditions in the RA.

CWM Response: The Agency's first comment under Attachment 1, Technical Review of RFI Report for The CWMCS Chicago Incinerator Facility takes issue with classifying the fill as a hydrogeologic unit: "Until such time that the fill material is characterized as a natural deposit, the term hydrogeologic unit is best omitted." This is the essence of the difficulty that was addressed when it was decided to use the analytical results from the clay samples as background. The fill material, comprising the piers, is a heterogeneous material. As such SS-11, SS-12 and SS-13 may or may not be representative of background. The clay layer underlies a nominal, six inch sediment layer in the Lake Calumet and represents the original contour of the Lake prior to placement of fill.

Section 2.0, Page 2-2 provides a discussion relative to using the clay samples for background. Part 1 of the FINAL RCRA FACILITY INVESTIGATION REPORT, November 1993 provides a discussion of the clay sampling program and Figure 1-2, Base Map/Existing Conditions, of Part 1, Section 1 shows the locations selected for the clay sampling program. For clarification, the report consists of three (3) parts and Appendices A through P. Appendix O of this document is the RFI Baseline Human Health Risk Assessment.

9. **Comment:** Section 2.1, Page 2-3, Paragraph 2. The text mentions "Appendix IX" without citing a specific reference. Presumably this is Appendix IX in the Code of Federal Regulations (CFR). A specific CFR reference should be cited.

Response: The first sentence of paragraph 2, page 2-3 will be revised to "...to 40 CFR Part 264, Appendix IX."

10. **Comment:** Section 2.1, Page 2-4, Paragraph 0. In Figure 2-1, the collection locations of surface soil samples SS-11, SS-12, and SS-13 are shown. These samples were apparently collected off facility to represent background conditions. However, the analytical data for these samples is not presented in Appendix A. If these samples were contaminated they could be used to illustrate anthropogenic contamination in the area. If the samples were not contaminated, they could be used as background samples. Therefore, the analytical data for these surface soil samples should be included in the RA.

CWM Response: The following text will be added to the end of paragraph 0, page 2-4. "three samples, S-11, S-12, and S-13, located approximately 400 ft. north of the facility were also

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collected during the RFI. Initially, these samples were intended to represent local baseline conditions. After evaluating the chemical constituents in the samples and considering that the adjacent pier is also constructed of fill materials, it was determined that fill material, regardless of sample location, is not representative of facility background. For reference, analytical data from the three samples is included in Appendix K.

11. **Comment:** Section 2.1, Page 2-5, Paragraph 1. Trichloroethene (TCE) was eliminated from consideration in the RA because the concentration of this compound detected in facility surface soil samples was not "significantly different" from concentrations measured in background samples. However, organics such as TCE that cannot be attributed to laboratory contamination should not be excluded from consideration in the RA. The RA should be revised to retain TCE as a COPC or provide a more detailed explanation of justifying the exclusion of this compound, including a discussion of potential other sources of TCE.

CWM Response: The Agency's response is inconsistent with its solid and hazardous waste regulations and guidances that explicitly require statistical evaluation of site-related and background ground-water monitoring data (U.S. Environmental Protection Agency, 1988; U.S. Environmental Protection Agency, 1989c; U.S. Environmental Protection Agency, 1991b; U.S. Environmental Protection Agency, 1992b). Facilities are required to conduct routine ground-water quality monitoring and data analysis to determine whether a statistically significant increase in the concentration of a chemical constituent(s) (or decrease for pH) has occurred. In the event the data indicate a statistically significant increase in a chemical constituent's concentration in a downgradient well, after further investigation or action, the U.S. EPA RCRA and CERCLA programs once again allow for a demonstration of compliance with Agency standards via a statistical comparison of ground water concentration data versus MCLs or ACLs. Moreover, the Agency has adopted a statistical approach for evaluation of soils data (U.S. Environmental Protection Agency, 1989a; U.S. Environmental Protection Agency, 1989b; U.S. Environmental Protection Agency, 1990a).

In addition, the Agency's response is inconsistent with documented information for the historically heavily industrialized area of Southeast Chicago where ubiquitous anthropogenic contamination by a variety of chemicals is to be expected, especially given the heterogeneous fill material used to create the land surface in the Lake Calumet area.

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Thus, the burden of identifying the "potential other sources" of such a widely used solvent and degreaser as TCE is unrealistic.

12. **Comment:** Section 3.0, Page 3-1, Paragraph 1. This paragraph discusses the objective of the exposure assessment. In discussing the objective, the paragraph appears to confuse the terms "exposure route" and "exposure pathway." The paragraph should be revised to clearly state that the objective of the exposure assessment includes identification of both potential exposure pathways and exposure routes.

CWM Response: The third bullet on page 3-1 will be revised as "Characterizing potential pathways and routes of exposure;"

13. **Comment:** Section 3.11, Page 3-3, Paragraph 1. This paragraph discusses potential worker exposure based on current work practices. However, although land use at the facility may remain industrial, work practices may change, resulting in greater worker exposure both within and outside the fenced area. Therefore, the RA should be revised to evaluate potential increased future exposure of workers to surface soil both within and outside the fenced area.

Also, the RA considers worker exposure to surface soils only. Future construction, utility maintenance, or remediation activities may result in worker exposure to subsurface soils and shallow groundwater. Although such exposure may be of short duration, the RA should be revised to assess potential worker exposure to subsurface soils and shallow groundwater. In addition, construction activities may result in generation of airborne particulates and organic vapors from subsurface soils. Therefore, the RA should also be revised to consider worker exposure to subsurface contamination.

CWM Response: CWM disagrees that the Human Health Risk Assessment (HHRA) needs revision to further account for potential future worker exposure pathways. The assumptions of an unprotected worker (i.e., a worker not wearing PPE) for the pathways evaluated in the HHRA are quite conservative. As discussed in response to Item 6 under the General Comments, under OSHA regulations, employers in both general industry and the construction industry are obliged to abide with specific requirements for hazardous waste and emergency operations that would preclude direct exposure via the pathways suggested. (see 29 CFR §1910.120 and §1926.65, respectively). Moreover, the recently promulgated OSHA rule revised its general industry standards for PPE to require employers to, among other things, perform a hazard assessment of workplace hazards that necessitate the use of PPE and if such a hazard is or may

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be present, to select PPE that will protect each affected employee from the hazard(s), prepare a written certification of the hazard assessment, and train employees on various elements of the PPE. Again, the likelihood of the scenario the Agency suggests in its comments above, of a worker being exposed to surface and subsurface soils, soil vapors, and ground water above health standards, is remote. Therefore, no revisions to this section of the HHRA are warranted.

14. **Comment:** Section 3.1.3, Page 3-4, Paragraph 1. This paragraph explains that exposure via ingestion of contaminated fish is not evaluated in the RA because "it is difficult to quantify the amount of chemical intake an individual might receive from consuming fish from Lake Calumet." However, sufficient data exist to estimate contaminant loading from the facility to Lake Calumet. Therefore, the RA should be revised to assess the risk from ingestion of contaminated fish; estimated pollutant loadings should be used to estimate the potential concentrations of contaminants from the facility in fish tissue.

CWM Response:

As the Agency states in its Supplemental Human Health Risk Assessment for the CWMCS site:

"...Fisherman may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties" (EPA, 1994, p. 2).

CWMCS is pleased that the Agency agrees that it is inappropriate to model the fish ingestion pathway. Given the consensus on this issue, no revision to the HHRA is warranted.

15. **Comment:** Section 3.3, Page 3-8, Table 3-2. This table has several deficiencies. First, the values presented in the column labeled "significance level" are poorly defined, and their function is not identified. Second, several of the H values presented in the table do not correspond with H values derived from the reference cited in Section 3.3 using the standard deviation and limit (UCL) of the arithmetic mean of a log-normal distribution cannot be replicated using the equation presented in the reference cited in Section 3.3. Therefore, the text discussion of the methods used to calculate or obtain the values in this table should be revised

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to clearly and thoroughly present the method of their calculation or the source from which they were obtained. Also, the calculations for the values presented in this table should be reviewed, and the footnotes to the table should be revised to clarify the purpose of the table.

CWM Response: The nonparametric Kolmogorov-Smirnov (KS) goodness-of-fit test with Lilliefors correction is an effective method for testing whether a data set has been drawn from an underlying normal distribution or a lognormal distribution if the data has been log transformed. The significance level indicates that, at the 95% level of confidence, the data set is statistically similar to a normal or a lognormal distribution (i.e., the data set is normally or lognormally distributed), or the data set is statistically different from a normal or a lognormal distribution (i.e., the data set does not fit one of the two distributions). A significance level (Column 4 of Table 3-2) greater than 0.05 indicates that the data set fits the distribution specified in Column 3. Conversely, if the significance level is less than 0.05, no relationship can be drawn from the data set. A revised Table 3-2 is attached.

Secondly, standard deviations for COPCs that were shown to be lognormally distributed were incorrectly transferred to Table 3-2. This error has been corrected in the attached revised Table 3-2. The H values in Table 3-2 were correct as originally listed.

Thirdly, the 95% UCL values presented in the table are correct; however, the standard deviations were not correct in the table. In addition, the mean values presented for the lognormally distributed data sets are actually geometric means. The arithmetic means are used in the 95% UCL calculation.

16. **Comment:** Section 3.3, Page 3-10, Paragraph 1. This paragraph discusses the use of the central tendency exposure scenario, which is included in a RA as an illustration of uncertainty. However, the wording used in this paragraph implies that the central tendency scenario describes only the exposures that may actually occur at the facility. Although central tendency exposures may be more likely than reasonable maximum exposure (RME) exposures, both are possible, and neither should be treated as impossible or unrealistic. This paragraph should either be deleted or revised to discuss only the relative likelihood of exposures.

CWM Response: The Agency's Science Advisory Board (SAB) documented numerous misapplications of scientific and

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statistical principals associated with the estimation of average and Reasonable Maximum Exposure (RME) scenarios. (Science Advisory Board, 1993) The SAB review found the Agency's risk assessment methodology used to develop exposure and risk calculations, to be seriously flawed, as they are inconsistent with the Agency's own final exposure assessment guidelines (U.S. Environmental Protection Agency, 1992a), since they ignore the spatial distribution of contaminants at a site and the distribution of individual behaviors that lead to exposure. (Science Advisory Board, 1993, p. 20)

The SAB Committee recommended that "...the spatial distribution of the concentration over the site must be considered along with a distribution reflecting the relative frequency with which people are likely to visit different parts of the site." (Science Advisory Board, 1993, p. 25) Specifically, the SAB Committee recommended that EPA improve its estimates of exposure by moving "...towards a full distributional approach in which distributions are developed for each of the terms in the exposure equation and a Monte Carlo analysis be applied to obtain the resulting distribution for exposure..." (Science Advisory Board, 1993, p. 28) In addition, the SAB Committee recommended that EPA improve its methods for characterizing contaminant concentrations by using geostatistical methods, such as kriging or triangulation. (Science Advisory Board, 1993, p. 25) All of these techniques are widely used and endorsed by skilled risk assessors, especially the use of Monte Carlo analysis.

As a result of the deficiencies in U.S. EPA risk assessment methodology identified in the SAB review, one cannot be certain whether the "central tendency" exposure estimates may be more likely than reasonable maximum exposure (RME) exposures, or whether either is even possible, much less determine the likelihood of these exposures. Hence, the only revisions which have been made are to Section 6.0, Qualitative Uncertainty Analysis, to indicate that the Agency's average and RME exposure scenario estimation methodology has been judged to be technically unsound by its own Science Advisory Board.

17. **Comment: Section 3.3.1, Page 3-10, Paragraph 3.** This paragraph discusses the sample analytical data used to estimate exposure point concentrations for on-facility workers. It appears that CWM has based exposure point concentrations on the data for 8 surface soil samples collected from within the fenced area of the facility, ignoring 12 other samples collected at the facility outside the fenced area. The two basic reasons given for this procedure are as follows: (1) on-facility workers currently

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have no work-related reason to go outside the fenced area, and (2) a statistical test shows that there is no "significant" difference between UCL concentrations calculated for the 8 samples collected inside the fenced area and those calculated for all 20 samples collected at the facility.

Neither of these reasons justifies exclusion of the 12 samples collected outside the fenced area from consideration. First, although the RA states that workers currently have no work-related reason to go outside the fenced area, it does not specifically state that they do not go outside the fenced area. Also, current work patterns may change in the future, resulting in greater worker exposure to soils outside the fenced area. Second, it is not clear how any statistical test can justify exclusion of samples that may assist in a more thorough and accurate characterization of soils at the facility. Excluding the 12 samples collected outside the fenced area from consideration decreases the number of samples available for performance of additional statistical tests or calculation of summary statistics. Also, chemicals such as hexachlorobenzene (a Class B2 carcinogen) which was apparently detected only in samples from outside the fenced area could be excluded from consideration.

The RA should be revised to consider the 12 samples collected outside the fenced area in one of two ways. In one approach, the areas inside and outside the fenced area could be treated as separate exposure areas. Separate exposure point concentrations could be estimated using the data for the samples collected in each area. Then exposures and resultant risks could be estimated separately for each area. Alternately, the data for all 20 soil samples could be combined to estimate exposure point concentrations for the facility as a whole. These concentrations could then be used to estimate exposures both within and outside the fenced area.

CWM Response: Exposure point concentrations for current and future workers have been revised as follows. As stated in Section 3.3.1, surface soil samples collected inside the fenced area were used to evaluate potential risks to current workers, since they have no work-related reason to go outside of the fence. Exposure point concentrations have been recalculated, however, to include three additional samples, SS-5, SS-20, and SS-21, which are located within the fence. Corrected exposure point concentrations for current workers are presented in the revised Table 3-3 (attached). A second paragraph will be added to Section 3.3.1 concerning future workers. Since it is possible that future workers may work throughout the facility, the RA has been revised for future receptors to include the remaining 9 samples taken outside the

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fence. Corrected exposure point concentrations for future workers are presented in the revised Table 3-4 (attached). A revised Risk Characterization chapter is also attached.

18. **Comment:** Section 3.3.2, Page 3-11, Paragraph 1. This paragraph states that inhalation of organic vapors is evaluated in Appendix O of the RFI report. However, this evaluation is not found in Appendix O. Therefore, this evaluation should be included in Appendix O, or the text should be revised to reference the correct appendix. Also, it is not clear why a brief summary of the procedure used to estimate exposure point concentrations for inhalation exposures is not presented in this section. Such a summary would assist the reader in understanding the overall approach to evaluation of the air pathway. Therefore, a brief summary of the procedure used to estimate exposure point concentrations for inhalation exposures should be added to this section.

Response: The air sampling program, utilizing an Isolation Flux Chamber, was completed earlier this year. Analytical results are currently being obtained and data validation remains to be completed. Upon receipt of this information, the requested information will be developed and incorporated into Appendix O.

19. **Comment:** Section 3.3.2, Page 3-11, Paragraph 2. This paragraph discusses the procedure used for estimating airborne particulate concentrations at the facility. However, the procedure used evaluates only particulate emissions resulting from wind erosion, apparently ignoring emissions resulting from vehicular traffic and construction activities because they are currently limited on the facility. However, because such traffic and activities have occurred in the past and may occur in the future, emissions resulting from them should be included in estimation of exposure point concentrations for the air pathway.

CWM Response: CWMCS did not ignore emission resulting from vehicular traffic or construction activities because they are currently limited on the facility.

The basis for focusing attention on particulate emission resulting from wind erosion is as follows:

1. CWMCS considered potential airborne particulate emissions resulting from vehicular traffic and construction activities in addition to emissions attributed to wind erosion. However, due to the fact that vehicular traffic is almost exclusively limited to areas of the facility which are paved, there is

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virtually no potential contribution from this source.

2. CWMCS has in place and maintains a Fugitive Particulate Operating Program (FPOP) for the CWMCS facility which is required in accordance with the environmental regulations of the State of Illinois. Specifically, Title 35 of the Illinois Administrative Code (IAC), Parts 212.309 and 212.310 require that the facility prepare and submit to the Illinois Environmental Protection Agency a written program which describes the procedures to be followed to control the generation of fugitive emissions from the facility. CWMCS maintains that the implementation of the procedures specified in the FPOP have and continue to be effective in controlling fugitive emissions which may be generated as a result of vehicular traffic or construction activities. The CWMCS FPOP program also includes the preparation and submittal of quarterly reports to the Illinois Environmental Protection Agency (IEPA) which document the effectiveness of this program. To date, as documented in the FPOP quarterly report to IEPA, there have been no actions which have required implementation of additional fugitive emission control procedures.

3. For major construction activities which may occur at the facility, the project plans specifically address requirements for the control of potential fugitive emissions to ensure that unacceptable levels of these emissions do not occur during construction activities.

For the reasons specified above, CWMCS maintains that the procedures identified which include the estimation of airborne particulate matter resulting from wind erosion is scientifically accurate and technically defensible for this facility.. Therefore, CWMCS proposes not to amend the procedure to include airborne particulate emissions resulting from vehicular traffic and construction activity and to maintain the procedure in its current form.

20. **Comment:** Section 3.3.2, Page 3-12, Paragraph 1. This paragraph presents data used in estimation of airborne particulate concentrations at the facility. Most of the data used consists of default parameters from EPA guidance. However, because of the nature of activities conducted at the facility and the facility's proximity to Midway Airport, a significant amount of facility-specific meteorological data exists. Therefore, the RA should be revised to use available facility-specific data in estimation of airborne particulate concentrations or should justify such data's omission. Also, the value for the diffusion height (DH), a term presented in

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the equation for estimating the particulate emission factor (PEF), is not given in this paragraph. The text should be revised to clearly present the value used for DH.

CWM Response: The meteorological data collected from the Midway Airport was initially considered for use in the air dispersion analysis. When the National Climatic Data Center was contacted, it was indicated that the data is routinely collected on paper with one day of meteorological measurements written per page. To enter the data into a compatible computer format, a modeler must determine the appropriate mixing height and stability classes for the data set. Since this task would be very time consuming, EPA default meteorological data were used. Use of these default data is expected to yield higher air concentration estimates than those predicted using the Midway or O'Hare airport data.

A diffusion height (DH) of 2 m (USEPA, 1991b) was used to derive the PEF.

21. **Comment:** Section 3.4.1.1, Page 3-14, Paragraph 2. This paragraph presents the values used to estimate worker soil ingestion. This estimate is made using an ingestion rate of 50 milligrams per day (mg/day) for all workers. However, the EPA guidance cited as a reference for this ingestion rate suggests that a higher ingestion rate, of 480 mg/day, may be more appropriate for evaluating short-term exposures during such activities as construction and landscaping. Therefore, the RA should be revised to estimate exposures for the short-term remediation worker based on a soil ingestion rate of 480 mg/day rather than the rate of 50 mg/day.

CWM Response: EPA's comment is correct that its guidance allows the use of a higher soil ingestion rate:

"For certain outdoor activities in the commercial/industrial setting (e.g., construction or landscaping), a soil ingestion rate of 480 mg/day may be used..." (Emphasis Added) (U.S. Environmental Protection Agency, 1991a, Attachment B)

Nonetheless, in view of the health and safety precautions required for general industry and the construction industry detailed in CWMCS's response to the sixth General Comment, the 50 mg/day was deemed to be the more appropriate value. Too, the 50 mg/day soil ingestion value has an empirical basis (Calabrese, Stanek, Gilbert, & Barnes, 1990) while the 480 mg/day value (Hawley, 1985) has none.

22. **Comment:** Section 3.4.1.2, Page 3-15, Paragraph 2. This

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paragraph discusses exposure of workers via dermal contact with airborne particulates. However, the RA does not specify whether the airborne concentrations were estimated using only data for the 8 soil samples collected from within the fenced area or data for all 20 soil samples collected at the facility. The RA should be revised to clearly state which samples data were used to estimate airborne contaminant concentrations.

CWM Response: The last sentence will be revised as follows. "Therefore, the concentration of COPCs in surface soil samples collected inside the fence (n = 11) shown in Table 3-3 and Equation 3-7 were used to model current exposures by these receptors." Reference the response to specific comment 17.

23. **Comment:** Section 3.4.1.2, Page 3-16, Paragraph 0. This paragraph presents the values and equations used to estimate the adsorbed dose resulting from dermal exposure to airborne particulates. However, it is not clear how the concentration of airborne contaminant (in milligrams of contaminant per cubic meter of air) is related to the concentration of particulate that adheres to the skin (in milligrams of particulate per square centimeter of skin). The RA should be revised to clearly explain this relationship.

CWM Response: The concentration of COPCs in fugitive dust in mg/m^3 was converted to units of mg/kg using the following conversion factors: $[(\text{m}^3/1000 \text{ L}) (\text{L}/1.29 \text{ g}) (1000 \text{ g}/\text{kg})]$ where 1.29 g/L is the density of air. These conversion factors are included in Equation 3-6 as CF1. Converting the concentration of COPCs in fugitive dust to mg/kg is equivalent to modeling direct dermal exposure to COPCs in soil. COPCs in fugitive dust could land on exposed skin surfaces and be adsorbed through the skin.

24. **Comment:** Section 3.4.1.2, Page 3-16, Paragraph 1. This paragraph discusses estimation of worker skin surface areas available for soil adherence. The estimation of these areas is strongly based on worker adherence to administrative controls, such as requirements for wearing gloves and long-sleeved shirts. Either the RA should clearly state that these requirements are consistently met, or the estimation of skin surface areas available for soil adherence should be made more conservative.

CWM Response: As described in the response to Item #6 of the General Comments, personal protective equipment (PPE) is a form of worker exposure control distinct from Administrative controls, which are passive control measures. Adherence to

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the OSHA guidelines will reduce the potential exposure to workers. Therefore, no changes to the HHRA have been made.

25. **Comment:** Section 3.4.2, Page 3-18, Paragraph 2. This paragraph presents an inhalation rate of 0.83 cubic meter per hour derived from a referenced respiration rate of 20 cubic meters per day. However, the value of 20 cubic meters per day that is referenced here is actually presented as 20 cubic meters per 8-hour day in the cited reference. The correct value can be converted to 2.5 cubic meters per hour. Therefore, the RA should be revised to replace the value of 0.83 cubic meters per hour with 2.5 cubic meters per hour.

CWM Response: The third sentence of paragraph 2 will be revised as follows. "The upper-bound respiration rate of 20/m³/workday (2.5 m³/hr assuming an 8-hour workday) was used to model intakes by all receptors (USEPA, 1991a)." Tables 3-7, 3-12, and 3-13 have been revised accordingly. A copy of these revised tables is attached.

26. **Comment:** Section 3.4.1.1, Page 3-26, Table 3-5. This table presents a value of 1.5 as the fraction of soil from the contaminated area ingested by remediation workers. The use of this value is appropriate. However, a footnote should be added to explain the function of this value.

CWM Response: The FI represents the length of time individuals spend on-site. Since a time-weighted FI value of 1.0 indicates that individuals work the default eight-hour day, the 1.5 value indicates that remediation workers were on-site more than the standard eight-hour workday. Similarly, FI values less than 1 indicate that workers are on-site less than the standard eight-hour workday. This information has been added to Table 3-5 to clarify the function of the FI value.

27. **Comment:** Section 3.4.1.2, Page 3-27, Table 3-6. This table directs the reader to "see text for chemical-specific values" for adsorption factors. However, no chemical-specific adsorption factors are presented in the RA; only default assumptions for volatile organic, semivolatile organic, and inorganic compounds are presented. Therefore, the table should be revised to state this, and the default assumptions should be added in a footnote to the table.

CWM Response: Table 3-6 is revised to reflect the fact that U.S. EPA Region I default dermal absorption factors for volatile organics, semi-volatile organics, and metals were used. A copy of the revised Table 3-6 is attached.

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28. **Comment:** Section 4.1, Pages 4-5 and 4-6, Table 4-1. Inhalation slope factors for cadmium and methylene chloride are referenced as being obtained from the Integrated Risk Information System (IRIS). However, these slope factors are not in IRIS. It appears that the slope factors were derived from unit risks appearing in IRIS. The procedure for determining the slope factors or the correct reference for these values should be provided.

Because this comment is based on review of only 25 percent of the toxicity factors in Table 4-1, all other toxicity factors in the table should be reviewed and verified.

CWM Response: Inhalation slope factors for beryllium, cadmium, 1, 1-dichloroethylene, hexachlorobenzene, and methylene chloride were derived from unit risk values, which are listed in brackets in Table 4-1, using the following equation:

$$\text{Inhalation Cancer Slope Factor (mg/Kg/d)}^{-1} = \text{Inhalation Unit Risk Value (ug/m}^3\text{)}^{-1} \times \frac{1}{(20 \text{ m}^3/\text{day}) (1/70 \text{ kg}) (\text{mg}/1000 \text{ } \mu\text{g})}$$

Sources for unit risk values are the same as those listed for the inhalation slope factors in Table 4-1. A footnote has been added to Table 4-1 clarifying which inhalation cancer slope factors were derived from unit risk values appearing in IRIS. See revised version of Table 4-1, attached.

29. **Comment:** Section 4.1, Page 4-6, Table 4-1. The subchronic and chronic inhalation reference concentrations (RfC) for methylene chloride are not in IRIS. A correct reference should be provided.

CWM Response: Subchronic and chronic inhalation reference concentrations for methylene chloride were taken from HEAST (1993). Table 4-1 has been corrected (see attached revised Table 4-1).

30. **Comment:** Section 5.2, Page 5-6, Table 5-1. The pathway hazard index (HI) values were checked using the hazard quotient (HQ) for chromium VI rather than the HQ for chromium (total); this approach was considered to be conservative. The HI values calculated for the on-facility security worker and the on-facility remediation worker are 0.008 and 0.1, respectively. Table 5-1 and the text in Section 5.2 where these risks are discussed should be revised to reflect these revised values.

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CWM Response: Chemical-specific HQs were listed for both Cr III and Cr VI in Table 5-1, and both of these HQs were included in the pathway hazard index values listed at the bottom of Table 1. HQs and HIs have been revised, since the upper-bound concentration of COPCs in soil is now based on all samples collected facility-wide (n = 20) for future receptors and all samples collected facility-wide (n = 20) for future receptors and all samples collected inside the fence only (n = 11) for current workers. Resulting HIs are 0.008 for the security worker, 0.01 for the incineration worker, and 0.1 for the remediation worker. A revised Table 5-1 is attached. The associated text has also been revised accordingly and is attached.

31. **Comment:** Section 5.2, Page 5-7, Table 5-2. Footnote "a" states that on-facility security and incineration workers were assumed to have dermal contact with fugitive dust only. However, fugitive dust that can be deposited on exposed skin can be inhaled. Also, if fugitive dust is deposited on workers hands, workers may also ingest this dust. Therefore, the RA should be revised to evaluate exposure to and risks from COPCs resulting from inhalation and incidental ingestion of fugitive dusts for on-facility security and incineration workers.

CWM Response: It is unclear how one would model the resuspension and subsequent inhalation of soil deposited on a workers skin. Hygiene practices would lead a worker to wash prior to eating, precluding the completion of this potential exposure pathway. Therefore, no revisions to the HHRA are warranted.

32. **Comment:** Section 5.2, Page 5-8, Table 5-3. This table and the text where the results in this table are discussed should be revised to incorporate changes recommended for Tables 5-1 and 5-2.

CWM Response: Table 5-3 and the associated text have been revised accordingly and are attached.

33. **Comment:** Section 5.2, Page 5-9, Table 5-4. This table presents a cumulative excess lifetime cancer risk of 3×10^{-7} for on-facility remediation workers. However, summing the chemical-specific excess lifetime cancer risks presented results in a cumulative value of 2×10^{-7} . The table and the text where the results in this table are discussed should be revised to present the cumulative excess lifetime cancer risk for on-facility remediation workers as 2×10^{-7} .

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CWM Response: Cumulative risk estimates have been revised, since the upper-bound concentration of COPCs in soil is now based on all samples collected facility-wide ($n = 20$) for future workers and all samples collected inside the fence ($n = 11$) for current receptors. Table 5-4 and the associated text have been revised and are attached.

34. **Comment:** Section 5.2, Page 5-11, Table 5-6. The table presents cumulative excess lifetime cancer risks for on-facility security workers, on-facility incineration workers, and on-facility remediation workers as 3×10^{-8} , 3×10^{-8} , and 5×10^{-9} respectively. However, summing the chemical-specific values presented results in cumulative excess lifetime cancer risk estimates of 7×10^{-9} , 7×10^{-9} , and 1×10^{-9} , respectively. This table and the text where the results in this table are discussed should be revised to include these new cumulative values.

CWM Response: Table 5-6 and the associated text have been revised and are attached.

35. **Comment:** Section 5.2, Page 5-12, Table 5-7. This table and the text in Section 5.2 where the results in this table are discussed should be revised to incorporate changes recommended for Tables 5-4 and 5-6.

CWM Response: Table 5-7 and the associated text have been revised and are attached.

36. **Comment:** Section 5.3, Page 5-4, Paragraph 1. This paragraph describes two exposure scenarios. The second scenario is described in Paragraph 3 on this page as the RME. Therefore, paragraph 1 should be revised to describe the second scenario discussed as the RME scenario.

CWM Response: "RME" has been changed to "facility-specific RME" when referring to risk estimates based on facility-specific exposure data versus standard default assumptions.

37. **Comment:** Section 5.3, Page 5-4, Paragraph 2. This paragraph discusses the risk results presented in Tables 5-3 and 5-7. The risks are described as RME values. This description is misleading because the risks were generated using facility-specific exposure assumptions and not RME assumptions. Therefore, the risks in Paragraph 2 should be defined as facility-specific values, not as RME values.

CWM Response: "RME" has been changed to "facility-specific RME" when referring to risk estimates based on facility-

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specific exposure data versus standard default assumptions.

38. **Comment:** Section 5.3, Page 5-14, Table 5-9. This table presents cumulative excess lifetime cancer risk estimates for incidental ingestion of soil, dermal contact with soil, and inhalation of particulates of 4×10^{-6} , 1×10^{-14} , and 9×10^{-8} , respectively. However, summing the chemical-specific estimates presented results in cumulative estimates for incidental ingestion of soil and inhalation of particulates of 5×10^{-6} and 3×10^{-8} , respectively (the cumulative estimate for dermal contact with soil remained the same). The table and the text where the results in this table are discussed should be revised to incorporate the new cumulative estimates.

CWM Response: Tables 5-9 and 5-10 and the associated text have been revised and are attached.

39. **Section 5.3, Page 5-15, Table 5-10.** This table and the text where the results in this table are discussed should be revised to incorporate the changes recommended for Table 5-7 and 5-9.

CWM Response: Tables 5-9 and 5-10 and the associated text have been revised and are attached.

40. **Comment:** Appendix A. This appendix presents three tables showing the concentrations of chemicals in specific surface soil samples. However, the tables do not clearly state what phase of the RFI the data presented are taken from. The tables in the appendix should be revised to clearly identify the RFI phase from which the data presented are taken.

Some of the data presented in the tables does not represent detected values but rather values equal to one-half of the sample quantitation limit (SQL). Presenting the data in this format makes it difficult to determine precisely which samples had detected values and which samples had values reported as BMDL. The tables should be revised to present all results that are BMDL in the format BMDLU (for example, 500U). This would allow readers to determine which samples chemicals were detected in and which samples they were not.

Finally, Figure 2-1 shows the off-facility collection location of three samples (SS-11, SS-12, and SS-13). However, the analytical results for these samples are not presented in the tables of Appendix A. The tables of Appendix A should be revised to include the analytical results for samples SS-11, SS-12, and SS-13.

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Response: Surface soil samples were only collected during Phase II of the RFI, therefore the tables do not require revision.

The data present in Appendix A is representative of the numerical values used in the risk assessment calculations, and therefore, presents the actually detected values as well as the values equal to one half of the SQL for the ND and BMDL values. Appendix N and Appendix K should be referred to for specific analytical results.

Appendix A does not include the results from the three off-site surface soil sampling locations (SS-11, SS-12, SS-13), as these results were not used in the risk assessment calculations. They are included in Appendix K of the REPORT.

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TABLE 3-2 (REVISED)
RESULTS OF THE KOLMOGOROV-SMIRNOV GOODNESS OF FIT TEST PERFORMED FOR METALS
AND ORGANIC CHEMICALS OF POTENTIAL CONCERN IN FACILITY SURFACE SOILS

Chemical	Sample Size	Distribution ^{a,f}	Significance Level ^b	Mean (μg/kg) ^c	Standard Deviation (μg/kg) ^d	H or t Statistic ^e	95% Upper Confidence Limit for the Distribution (μg/kg)	Maximum Measured Value (μg/kg)
METALS								
Antimony	20	none (assumed normal)	0.002	12,307	19,617	1.729	19,892	90,000
Beryllium	20	normal	0.493	1357	708	1.729	1630	3400
Cadmium	20	lognormal	0.354	5405	1.0	2.612	16,527	55,700
Chromium	20	lognormal	0.055	170,076	1.6	3,460	1,977,241	1,320,000
Copper	20	normal	0.814	42,450	15,926	1.729	48,607	78,000
Lead	20	lognormal	0.610	89,054	1.0	2.655	288,498	1,260,000
Mercury	20	lognormal	0.081	135.6	0.70	2.210	247	540
Selenium	20	lognormal	0.181	644	0.60	2.100	1029	1600
Silver	20	none (assumed lognormal)	0.007	1274	0.70	2.260	2464	3700
Zinc	20	lognormal	0.150	164,720	0.90	2.500	435,220	1,570,000
ORGANICS								
Benz(a)anthracene	20	lognormal	0.299	1398	1.2	2.870	6194	6000
Benzo(a)pyrene	20	normal	0.200	1198	807	1.729	1510	2760
Benzo(b)fluoranthene	20	normal	0.431	2394	1862	1.729	3113	7550
Benzo(k)fluoranthene	20	none (assumed lognormal)	0	758	1.1	2.740	2773	2230

TABLE 3-2 (REVISED)
RESULTS OF THE KOLMOGOROV-SMIRNOV GOODNESS OF FIT TEST PERFORMED FOR METALS
AND ORGANIC CHEMICALS OF POTENTIAL CONCERN IN FACILITY SURFACE SOILS
 - Continued -

Chemical	Sample Size	Distribution ^{a,c}	Significance Level ^b	Mean (μg/kg) ^c	Standard Deviation (μg/kg) ^d	II or t Statistic ^e	95% Upper Confidence Limit for the Distribution (μg/kg)	Maximum Measured Value (μg/kg)
Chrysene	20	normal	0.329	1699	1447	1.729	2258	5770
1,1-Dichloroethylene	19 ^a	none (assumed normal)	0	3.5	4.7	1.729	5.35	18.5
Fluoranthene	20	lognormal	1.000	1544	1.2	2.900	7148	9380
Hexachlorobenzene	20	none (assumed lognormal)	0	425	1.3	3.010	2323	3100
Indeno(1,2,3-cd)pyrene	20	none (assumed lognormal)	0	952	1.2	2.850	4070	3250
Methylene chloride	20	none (assumed normal)	0	2.385	2.1	1.729	3.2	11.0
Phenanthrene	20	lognormal	0.596	1469	1.4	3.200	10,919	19,105
Pyrene	20	lognormal	0.132	1466	1.2	2.860	6341	7750

^a Sample size was 20 (all surface soil samples from the facility) unless otherwise noted.

^b The data were assumed to fit the distribution if the results of the K-S test are significant at the 95% level of confidence. A significance level greater than 0.05 indicates that the data set fits the distribution specified in Column 3. Conversely, a significance level of less than 0.05 indicates that no relationship can be drawn from the data set.

^c Arithmetic means are reported for chemicals shown to be normally distributed, while the geometric mean is reported for chemicals shown to be lognormally distributed.

- ^d Arithmetic standard deviations are reported for chemicals shown to be normally distributed, while the arithmetic standard deviation of the log-transformed data is reported for chemicals shown to be lognormally distributed.
- ^e The H statistic and Equation 3-2 were used to calculate upper confidence limits (UCLs) for chemicals with a lognormal distribution, while the t statistic and Equation 3-1 were used to calculate UCL values for chemicals with a normal distribution.
- ^f Chemical whose data did not fit any distribution (i.e., those labeled "none") were assumed to fit the distribution (i.e., normal or lognormal) that yielded the higher UCL value.
- ^g Sample size equals 19, since one sample was deemed unreliable in the data validation process.

TABLE 3-3A (REVISED)
EXPOSURE POINT CONCENTRATIONS FOR SURFACE SOIL USED TO MODEL EXPOSURES FOR ALL CURRENT WORKERS^a

Chemical	Sample Size ^a	Distribution ^{a,c}	Range (µg/kg)	Mean ^b (µg/kg)	Standard Deviation ^c (µg/kg)	95% Upper Confidence Limit (µg/kg)	Maximum Measured Value (mg/kg)	Exposure-Point Concentration Used to Model Intakes ^d (µg/kg)
METALS								
Antimony	11	none (assumed lognormal)	3400 - 23,000	6816	0.91	23,342	23,000	23,000
Beryllium	11	normal	270 - 3400	1421	827	1873	3400	1873
Cadmium	11	lognormal	540 - 55,700	6960	1.25	60,835	55,700	55,700
Chromium (total)	11	normal	8900 - 1,320,000	625,991	479,490	887,955	1,320,000	887,955
Copper	11	normal	15,000 - 78,000	39,273	17,106	48,618	78,000	48,618
Lead	11	lognormal	11,000 - 120,000	49,021	0.66	100,689	120,000	100,689
Mercury	11	normal	46 - 250	106.4	60.8	139.6	250	139.6
Selenium	11	lognormal	295 - 1600	752	0.63	1468	1600	1468
Silver	11	normal	600 - 3700	2273	1271	2967	3700	2967
Zinc	11	lognormal	40,000 - 251,000	97,247	0.52	160,473	251,000	160,473
ORGANICS								
Benzo(a)anthracene	11	lognormal	195 - 4650	615	0.96	2357	4650	2357
Benzo(a)pyrene	11	lognormal	140 - 1500	414	0.98	1670	1500	1500
Benzo(b)fluoranthene	11	lognormal	251 - 2940	740	0.98	3017	2940	2940
Benzo(k)fluoranthene	11	lognormal	140 - 1500	365	0.99	1516	1500	1500
Chrysene	11	lognormal	170 - 1730	552	0.83	1586	1730	1586
1,1-Dichloroethylene	11	none (assumed lognormal)	1.6 - 18.5	2.5	0.92	8.9	18.5	8.9
Fluoranthene	11	lognormal	150 - 2910	701	0.94	2568	2910	2568

TABLE 3-3A (REVISED)
EXPOSURE POINT CONCENTRATIONS FOR SURFACE SOIL^a
- Continued -

Chemical	Sample Size ^a	Distribution ^{a,c}	Range (µg/kg)	Mean ^b (µg/kg)	Standard Deviation ^c (µg/kg)	95% Upper Confidence Limit (µg/kg)	Maximum Measured Value (mg/kg)	Exposure-Point Concentration Used to Model Intakes ^d (µg/kg)
Hexachlorobenzene	11	none (assumed lognormal)	ND - 1150	188	0.93	665	1150	665
Indeno(1,2,3-cd)pyrene	11	none (assumed lognormal)	210 - 2200	413	0.95	1542	2200	1542
Methylene chloride	11	none (assumed normal)	1.6 - 11	2.5	2.8	4.1	11	4.1
Phenanthrene	11	lognormal	124 - 19,105	669	1.4	10,212	19,105	10,212
Pyrene	11	lognormal	132 - 2480	696	1.0	3116	2480	2480

^a Soil samples collected from inside the fence only [i.e., samples SS-1 through SS-5, SS-14 through SS-17, and SS-20 and SS-21; n = 11). Non-detect values were assumed to be equal to one-half the sample quantitation limit.

^b Arithmetic means are reported for chemicals shown to be normally distributed, while the geometric mean is reported for chemicals shown to be lognormally distributed.

^c Arithmetic standard deviations are reported for chemicals shown to be normally distributed, while the arithmetic standard deviation of the log-transformed data is reported for chemicals shown to be lognormally distributed.

^d The maximum value was used as the exposure-point concentration if the calculated 95% upper confidence limit exceeded the maximum value.

^e Chemical whose data did not fit any distribution (i.e., those labeled "none") were assumed to for the distribution (normal or lognormal) that yielded the higher UCL value.

TABLE 3-3B (REVISED)
EXPOSURE POINT CONCENTRATIONS FOR SURFACE SOIL USED TO MODEL EXPOSURES BY ALL FUTURE RECEPTORS^a

Chemical	Sample Size ^a	Distribution ^c	Range (µg/kg)	Mean ^b (µg/kg)	Standard Deviation ^c (µg/kg)	95% Upper Confidence Limit (µg/kg)	Maximum Measured Value (mg/kg)	Exposure-Point Concentration Used to Model Intakes ^d (µg/kg)
METALS								
Antimony	20	none (assumed normal)	3400 - 90,000	12,307	19,617	19,892	90,000	19,892
Beryllium	20	normal	270 - 3400	1357	708	1630	3400	1630
Cadmium	20	lognormal	540 - 55,700	5405	1.0	16,527	55,700	16,527
Chromium (total)	20	lognormal	8900 - 1,320,000	170,076	1.6	1,977,241	1,320,000	1,320,000
Copper	20	normal	15,000 - 78,000	42,450	15,926	48,607	78,000	48,607
Lead	20	lognormal	11,000 - 1,206,000	89,054	1.0	288,498	1,260,000	288,498
Mercury	20	lognormal	46 - 540	135.6	0.7	246.8	540	246.8
Selenium	20	lognormal	295 - 1600	644	0.6	1029	1600	1029
Silver	20	none (assumed lognormal)	600 - 3700	1274	0.7	2464	3700	2464
Zinc	20	lognormal	40,000 - 1,570,000	164,720	0.9	435,220	1,570,000	435,220
ORGANICS								
Benzo(a)anthracene	20	lognormal	195 - 6000	1398	1.2	6194	6000	6000
Benzo(a)pyrene	20	normal	140 - 2760	1198	807	1510	2760	1510
Benzo(b)fluoranthene	20	normal	251 - 7550	2394	1862	3113	7550	3113
Benzo(k)fluoranthene	20	none (assumed lognormal)	140 - 2230	758	1.1	2773	2230	2230
Chrysene	20	normal	170 - 5770	1699	1447	2258	5770	2258
1,1-Dichloroethylene	19	none (assumed normal)	1.7 - 18.5	3.5	4.7	5.35	18.5	5.35

TABLE 3-3B (REVISED)
EXPOSURE POINT CONCENTRATIONS FOR SURFACE SOIL^a
- Continued -

Chemical	Sample Size ^a	Distribution ^a	Range (µg/kg)	Mean ^b (µg/kg)	Standard Deviation ^c (µg/kg)	95% Upper Confidence Limit (µg/kg)	Maximum Measured Value (mg/kg)	Exposure-Point Concentration Used to Model Intakes ^d (µg/kg)
Fluoranthene	20	lognormal	150 - 9380	1544	1.2	7148	9380	7148
Hexachlorobenzene	20	none (assumed lognormal)	110 - 3100	425	1.3	2323	3100	2323
Indeno(1,2,3-cd)pyrene	20	none (assumed lognormal)	210 - 3250	952	1.2	4070	3250	3250
Methylene chloride	20	none (assumed normal)	1.6 - 11	2.385	2.1	3.2	11	3.2
Phenanthrene	20	lognormal	124 - 19,105	1469	1.4	10,919	19,105	10,919
Pyrene	20	lognormal	132 - 7750	1466	1.2	6341	7750	6341

^a Soil samples collected from the entire facility [i.e., samples from both inside and outside the fence were used (Samples SS-1 through SS-10 and SS-15 through SS-23; n = 20)]. Non-detect values were assumed to be equal to one-half the sample quantitation limit.

^b Arithmetic means are reported for chemicals shown to be normally distributed, while the geometric mean is reported for chemicals shown to be lognormally distributed.

^c Arithmetic standard deviations are reported for chemicals shown to be normally distributed, while the arithmetic standard deviation of the log-transformed data is reported for chemicals shown to be lognormally distributed.

^d The maximum value was used as the exposure-point concentration if the calculated 95% upper confidence limit exceeded the maximum value.

^e Chemical whose data did not fit any distribution (i.e., those labeled "none") were assumed to for the distribution (normal or lognormal) that yielded the higher UCL value.

TABLE 3-4 (REVISED)
PREDICTED CONCENTRATION OF CHEMICALS OF POTENTIAL CONCERN
IN AIR AS PARTICULATES

Chemical of Concern	Mean Measured Concentration in Surface Soils Facility Wide (mg/kg) ^a	Average Estimated Concentration in Air as Particulates (mg/m ³) ^b	Upper-Bound or Maximum Measured Concentration in Surface Soils Facility Wide (mg/kg) ^c	Upper-Bound Estimated Concentration in Air as Particulates (mg/m ³) ^b
METALS				
Antimony	12.31	1.8x10 ⁻⁸	19.89	2.9x10 ⁻⁸
Beryllium	1.36	2.0x10 ⁻⁹	1.63	2.4x10 ⁻⁹
Cadmium	5.41	7.9x10 ⁻⁹	16.53	2.4x10 ⁻⁸
Chromium (total)	170.1	2.5x10 ⁻⁷	1320	1.9x10 ⁻⁶
Copper	42.45	6.2x10 ⁻⁸	48.61	7.1x10 ⁻⁸
Lead	89.05	1.3x10 ⁻⁷	288.5	4.2x10 ⁻⁷
Mercury	0.136	2.0x10 ⁻¹⁰	0.25	3.7x10 ⁻¹⁰
Selenium	0.64	9.4x10 ⁻¹⁰	1.03	1.5x10 ⁻⁹
Silver	1.27	1.9x10 ⁻⁹	2.46	3.6x10 ⁻⁹
Zinc	164.7	2.4x10 ⁻⁷	435.2	6.4x10 ⁻⁷
ORGANICS				
Benzo(a)anthracene	1.4	2.0x10 ⁻⁹	6.0	8.8x10 ⁻⁹
Benzo(a)pyrene	1.2	1.8x10 ⁻⁹	1.51	2.2x10 ⁻⁹
Benzo(b)fluoranthene	2.39	3.5x10 ⁻⁹	3.11	4.6x10 ⁻⁹
Benzo(k)fluoranthene	0.76	1.1x10 ⁻⁹	2.23	3.3x10 ⁻⁹
Chrysene	1.7	2.5x10 ⁻⁹	2.26	3.3x10 ⁻⁹
1,1-Dichloroethylene	0.0035	5.1x10 ⁻¹²	0.0054	7.9x10 ⁻¹²
Fluoranthene	1.54	2.3x10 ⁻⁹	7.15	1.0x10 ⁻⁸
Hexachlorobenzene	0.425	6.2x10 ⁻¹⁰	2.32	3.4x10 ⁻⁹
Indeno(1,2,3-cd)pyrene	0.95	1.4x10 ⁻⁹	3.25	4.8x10 ⁻⁹
Methylene chloride	0.0024	3.5x10 ⁻¹²	0.0032	4.8x10 ⁻¹²
Phenanthrene	1.47	2.2x10 ⁻⁹	10.92	1.6x10 ⁻⁸
Pyrene	1.47	2.2x10 ⁻⁹	6.34	9.3x10 ⁻⁹

^a The arithmetic mean was used if the data were normally distributed. The geometric mean was used for lognormally distributed data (see Table 3-2). Based on all surface soil samples collected facility-wide (n = 20).

^b Calculated using Equations 3-3 and 3-4 from USEPA (1991b).

^c The 95 percent upper confidence limit or the maximum measured value was used, whichever was lower.

TABLE 3-6 (REVISED)
PARAMETERS USED TO MODEL EXPOSURES
FROM DERMAL CONTACT WITH SOIL BY CURRENT RECEPTORS^a

Parameter	Receptor Group	RME and Average Values Used ^b	Reference
Skin Surface Area (SA)	Remediation Workers	1180 cm ²	USEPA, 1990a
	Security and Incineration Workers	2020 cm ²	
Adherence Factor (AF)	All Workers	1.0 mg/cm ² (RME) 0.2 mg/cm ² (Average)	USEPA, 1992b
Absorption Factors (ABS)	All Workers	Volatile organics = 50% (0.5) Semi-volatile organics = 5% (0.05) Metals = 1% (0.01) ^c	USEPA, 1989b
Exposure Frequency (EF)	Remediation Worker	300 days/year (6 days/week)	Facility-specific data
	All Other Workers	250 days/year	USEPA, 1991a
Exposure Duration (ED)	Remediation Worker	1 year	Facility-specific data
	All Other Workers	8 years (RME) 3 years (average)	
Body Weight (BW)	All Workers	70 kg	USEPA, 1991a
Averaging Time (AT)	Remediation Worker	365 days - non-carcinogens	USEPA, 1989a
	All Other Workers	2920 days - non-carcinogens (RME) 1095 days - non-carcinogens (average)	
	All Workers	25,550 days (carcinogens)	

^a For operations and security personnel, the concentration of COPCs in fugitive dusts and Equation 3-6 were used. For the remediation worker, the concentrations of COPCs in surface soils and Equation 3-7 were used.

^b If a specific average value is not listed, the RME value was used.

^c See Section 3.4.1.2 for an explanation of these values.

TABLE 3-7 (REVISED)
PARAMETERS USED TO MODEL INHALATION EXPOSURES
BY CURRENT RECEPTORS

Parameter	Receptor Group	RME and Average Values Used ^a	Reference
Respiration Rate (RR)	All Workers	2.5 m ³ /hour	USEPA, 1991a
Exposure Time (ET)	Remediation Worker	10 hours/day	Facility-specific data
	Security Worker	8 hours/day	
	Incineration Worker	8 hours/day	
Exposure Frequency (EF)	Remediation Worker	300 days/year (6 days/week)	Facility-specific data
	All Other Workers	250 days/year	USEPA, 1991a
Exposure Duration (ED)	Remediation Worker	1 year	Facility-specific data
	All Other Workers	8 years (RME) 3 years (average)	
Body Weight (BW)	All Workers	70 kg	USEPA, 1989a
Averaging Time (AT)	Remediation Worker	365 days - non-carcinogens	USEPA, 1989a
	All Other Workers	2920 days - non-carcinogens (RME) 1095 days - non-carcinogens (average)	
	All Workers	25,550 days - carcinogens	

^a If a specific average value is not listed, the RME value was used.

TABLE 3-12 (REVISED)
PARAMETERS USED TO MODEL INHALATION EXPOSURES
BY HYPOTHETICAL FUTURE WORKERS
USING STANDARD DEFAULT EXPOSURE ASSUMPTIONS

Parameter	RME and Average Values Used*	Reference
Respiration Rate (RR)	2.5 m ³ /hour (assumes an 8-hr workday)	USEPA, 1991a
Exposure Time (ET)	8 hours/day	USEPA, 1991a
Exposure Frequency (EF)	250 days/year	USEPA, 1991a
Exposure Duration (ED)	25 years	USEPA, 1991a
Body Weight (BW)	70 kg	USEPA, 1989a
Averaging Time (AT)	9125 days - non-carcinogens	USEPA, 1989a
	25,550 days - carcinogens	

* If a specific average value is not listed, the RME value was used.

TABLE 3-13 (REVISED)
PARAMETERS USED TO MODEL INHALATION EXPOSURES BY FUTURE WORKERS
USING FACILITY-SPECIFIC EXPOSURE DATA

Parameter	RME and Average Values Used*	Reference
Respiration Rate (RR)	2.5 m ³ /hour (assuming an 8-hour workday)	USEPA, 1991a
Exposure Time (ET)	8 hours/day	Facility-specific data
Exposure Frequency (EF)	250 days/year	USEPA, 1991a
Exposure Duration (ED)	8 years (RME) 3 years (average)	Facility-specific data
Body Weight (BW)	70 kg	USEPA, 1989a
Averaging Time (AT)	2090 days - non-carcinogens (RME) 1095 days - non-carcinogens (average) 25,550 days - carcinogens	USEPA, 1989a

* If a specific average value is not listed, the RME value was used.

TABLE 4-1 (REVISED)
TOXICITY CONSTANTS FOR CHEMICALS OF POTENTIAL CONCERN IN CWMCS SURFACE SOIL

Chemical	Subchronic*/Chronic Oral Reference Dose (mg/kg-day)/ Target Effect/Organ	Uncertainty Factor	Subchronic*/Chronic Inhalation Reference Concentration (mg/kg-day)	Oral Cancer Slope Factor (mg/kg-day) ⁻¹ [Unit Risk Value (μg/L)]	Inhalation Cancer Slope Factor (mg/kg-day) ⁻¹	Weight of Evidence*
METALS						
Antimony	4x10 ⁻⁴ ^H / 4x10 ⁻⁴ ^I blood, lifespan	1000	NA ^a	NA	NA	---
Beryllium	5x10 ⁻³ ^H / 5x10 ⁻³ ^I no significant adverse effects	100	NA	4.3 ^I [1.2x10 ⁻⁴ μg/L]	8.4 ^{I, C} [2.4x10 ⁻³ μg/m ³]	B2
Cadmium (food)	NA / 0.001 ^I kidney	10	NA	NA	6.3 ^{I, C} [1.8x10 ⁻³ μg/m ³]	B1
Chromium (III)	10 ^H / 1.0 ^I liver	1000	NA	NA	NA	---
Chromium (VI)	0.02 ^H / 0.005 ^I	500	NA	NA	41 ^I [1.2x10 ⁻² μg/m ³]	A
Copper	0.037 ^H / 0.037 ^H gastrointestinal irritation	NA	NA	NA	NA	D
Lead	NA	NA	NA	NA	NA	B2
Mercury	3x10 ⁻⁴ ^H / 3x10 ⁻⁴ ^H neurotoxicity; kidney	1000	8.6x10 ⁻³ / 8.6x10 ⁻³ ^H	NA	NA	D
Selenium	0.005 ^H / 0.005 ^I dermatitis; hair loss	3	NA	NA	NA	D
Silver	5x10 ⁻³ ^H / 5x10 ⁻³ ^I argyria	3	NA	NA	NA	D
Zinc	0.3 ^H / 0.3 ^I anemia	3	NA	NA	NA	D

TABLE 4-1 (REVISED)
TOXICITY CONSTANTS FOR CHEMICALS OF POTENTIAL CONCERN IN CWMCS SURFACE SOIL
-Continued-

Chemical	Subchronic ^a /Chronic Oral Reference Dose (mg/kg-day)/ Target Effect/Organ	Uncertainty Factor	Subchronic ^a /Chronic Inhalation Reference Concentration (mg/kg-day)	Oral Cancer Slope Factor (mg/kg-day) ⁻¹ [Unit Risk Value (μg/L)]	Inhalation Cancer Slope Factor (mg/kg-day) ⁻¹	Weight of Evidence ^f
ORGANICS						
1,1-Dichloroethylene	9x10 ⁻³ ^H / 9x10 ⁻³ ^I kidney	1000	NA	0.6 ^I [1.5x10 ⁻⁵ μg/L]	0.175 ^{I, c} [5.0x10 ⁻⁵ μg/m ³]	C
Di-n-butyl phthalate	1.0 ^H / 0.1 ^I kidney, liver	1000	NA	NA	NA	D
Fluoranthene	0.4 ^H / 0.04 ^I liver, blood	100	NA	NA	NA	D
Hexachlorobenzene	8x10 ⁻⁴ ^H / 8x10 ⁻⁴ ^I liver, blood	100	NA	1.6 ^{I, d} [4.6x10 ⁻⁵ μg/L]	1.6 ^{I, c, d} [4.6x10 ⁻⁴ (μg/m ³)]	B2
Methylene chloride	0.06 ^H / 0.06 ^I liver toxicity	100	0.86 ^H / 0.86 ^H	7.5x10 ⁻³ ^I [2.1x10 ⁻⁷ μg/L]	1.65x10 ⁻³ ^{I, c} [4.7x10 ⁻⁷ μg/m ³]	B2
Pyrene	0.3 ^H / 0.03 ^I kidney	3000	NA	NA	NA	D

^a All subchronic oral references doses and inhalation reference concentrations are from USEPA (1992, 1993b).

^b A reference dose, reference concentration, or cancer slope factor is not available for that chemical (all NA values in table) in either IRIS OR HEAST.

^H Source of toxicity constant is *Health Effects Assessment Summary Tables* (USEPA, 1992; 1993b).

^I Source of toxicity constant is USEPA's IRIS on-line database (USEPA, 1993a).

^c Inhalation slope factors were derived from unit risk values using the equation:

^d These cancer slope factors have been withdrawn from IRIS.

$$Risk = Unit\ Concentration\ (\mu g/m^3) \times \frac{CSF}{(20\ m^3/day)\ (1/70\ kg)\ (mg/1000\ \mu g)}$$

Sources for unit risk values are the same as those listed for the inhalation slope factors.

- * Group A - Human Carcinogen (sufficient evidence of carcinogenicity in humans)
- Group B - Probable Human Carcinogen (B1-limited evidence of carcinogenicity in humans; B2-sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)
- Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in the animals and inadequate or lack of human data)
- Group D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)

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5.0 RISK CHARACTERIZATION (REVISED)

Risk characterization is the description of the nature and magnitude of the potential human health risk associated with the CWMCS facility under the assumed exposure scenarios. It combines the results of the health assessment (i.e., hazard identification and dose-response assessment) and exposure assessment portions to provide numerical estimates of health risk. In accordance with USEPA (1989a) guidance, a conservative (health-protective) approach that is likely to overestimate, rather than underestimate, the risk was used in this assessment. Risks were calculated for both current and future land use scenarios.

5.1 Risks Associated with Human Exposure to Chromium

The toxicity of chromium depends upon the form (species) in which it occurs in the environment. While Cr^{+6} is generally considered more toxic than Cr^{+3} , chromium occurs in nature primarily as Cr^{+3} (Callahan *et al.*, 1979). Hexavalent chromium is considered a known human carcinogen by inhalation. Excess lung cancer has been associated with workers in the chromate producing industry. Furthermore, USEPA (1993a,b) has developed separate oral RfDs for Cr^{+3} and Cr^{+6} (Table 4-1). Since facility-specific data on the fraction of chromium in surface soils that is actually Cr^{+6} were collected, these data were used in the risk assessment calculations. Cr^{+6} levels measured in all three surface soil samples analyzed were below current detection limits (<0.57 to <0.62 mg/kg). However, since only three surface soil samples were analyzed for Cr^{+6} , data collected at chromite ore processing facilities were used to model RME exposures. Paustenbach *et al.* (1991) reported that chromite ore processing residues, also called slag, typically contain 1 to 5 percent chromium VI. Using these data and the fact that Cr^{+6} is very soluble and does not sorb readily to clay (Callahan *et al.*, 1979), we assumed that 1% of the total chromium sorbed to soil particulates was Cr^{+6} for the RME scenario. If the resulting hazard indices exceeded unity or risk estimates exceeded 1×10^{-6} , average risks were calculated assuming that all chromium measured in facility surface soils is Cr^{+3} . This approach is reasonable, since facility-specific data indicate that all chromium measured may, in fact, be Cr^{+3} .

5.2 Potential Risks Associated With Current Land Use Conditions

Potential risks associated with current land use conditions were calculated for facility workers assuming that current workers were exposed to COPCs in surface soil samples collected inside the fence only ($n = 11$). Potential risks associated with exposure to facility-related COPCs for off-site residents, trespassers, and recreational users of Lake Calumet were not quantified as detailed in Sections 3.1.2 through 3.1.4 of this report. Tables 5-1 and 5-2 present individual COPC hazard quotients (HQs) and pathway hazard indices (HIs) for all three receptor groups (workers) exposed to facility-related COPCs via incidental ingestion of soil and dermal contact with soil, respectively. In this and subsequent tables, "NA" was used when toxicity data were not available for a given COPC. Given the lack of USEPA-approved toxicity constants (RfDs, RfCs, or CSFs) for these chemicals, hazard quotients and risk estimates could not be calculated. Potential risks from exposure to non-carcinogenic chemicals were treated additively rather than individually. Since the target organ of toxicity is variable for the COPCs (see Table 4-1), a summary hazard index calculation for all COPCs is likely to substantially overestimate these values, and thus be conservative.

Table 5-1 shows that all individual chemical HQs and pathway HIs for the soil ingestion pathway were less than 1 for all three worker groups evaluated. Pathway HIs ranged from 0.008 for the current on-site security worker to 0.1 for the current short-term impoundment remediation worker. Table 5-2 shows that all individual chemical HQs and pathways HIs for the dermal absorption pathway were also less than 1 for all three on-site worker groups evaluated. Pathway HIs are estimated to be 0.02 for the current remediation (impoundment) worker and 2×10^{-11} for the current incineration and security workers.

Inhalation reference concentrations (RfCs) were available for mercury and methylene chloride only (Table 4-1). Using these RfCs, inhalation pathway HIs are estimated to be 1×10^{-6} , 8×10^{-7} , and 8×10^{-7} , for the current remediation, security, and incineration workers, respectively. Cumulative RME HIs (i.e., the HI value summed across all three complete exposure pathways) are summarized in Table 5-3. Table 5-3 shows that the cumulative RME HI for the incineration,

security, and remediation workers are all less than 1, indicating no reason for health risk concern. Cumulative RME HIs are estimated to be 0.008 for the current security worker, 0.01 for the incineration worker, and 0.1 for the current short-term impoundment remediation worker. Table 5-3 shows that adverse, non-carcinogenic health effects are not probable for individuals who may be currently exposed to contaminants from ingestion or dermal contact with soil and via inhalation of particulates.

Tables 5-4 through 5-6 present chemical-specific and cumulative upper bound individual excess cancer risk estimates for all receptor groups under the RME scenario via soil ingestion, dermal absorption, and inhalation of particulates, respectively. Table 5-4 shows that risk estimates for the soil ingestion pathway are less than or equal to 1×10^{-6} for each of the COPCs identified for surface soil. Pathway risk estimates are 3×10^{-7} for the on-site security worker, 6×10^{-7} for the incineration worker, and 3×10^{-7} for the short-term remediation worker. Table 5-5 shows that chemical-specific risk estimates for the dermal pathway are also less than 1×10^{-6} . Pathway risk estimates for the dermal pathway are 3×10^{-15} for the current incineration worker and security worker and 2×10^{-7} for the short-term remediation worker. The short-term remediation was assumed to be exposed directly to COPCs present in surface soil, while the incineration and security workers were assumed to be exposed to COPCs in fugitive dust. Table 5-6 shows that the potential individual excess lifetime cancer risks associated with inhalation of particulates that may be resuspended from the surface soil are negligible relative to risks from incidental ingestion of soil. Cumulative RME potential individual excess cancer inhalation risks for current receptors range from 2×10^{-8} for the current incineration and security workers to 4×10^{-9} for the impoundment remediation worker (Table 5-6). Cumulative RME potential lifetime excess cancer risks (i.e., risks summed across all three complete exposure pathways) are estimated to be 3×10^{-7} for the individual who routinely patrols the property, 6×10^{-7} for individuals who work in and around the incineration complex, and 5×10^{-7} for the short-term remediation worker (Table 5-7). For the incineration and security workers, more than 90% of the cumulative excess lifetime cancer risk is attributable to incidental ingestion of soil. For the short-term remediation worker, 60% is due to incidental ingestion of soil, while 40% is attributable to dermal contact with soil.

5.3 Future Land Use Conditions

Future land use conditions were modeled assuming two different exposure scenarios. The first scenario evaluated worker exposures assuming that all individuals were on-site eight hours a day, five days a week, 50 weeks a year, for 25 years (USEPA, 1991a). All future receptors were assumed to be exposed to surface soils facility-wide ($n = 20$). This scenario is referred to as using facility-specific exposure data. The second scenario assumed that workers in the future would potentially be exposed to facility-related COPCs in air (particulates) and surface soil eight hours a day, five days a week, 50 weeks a year, for eight years.

Table 5-8 presents HQs and pathway HIs for future receptors exposed via incidental ingestion of soil, dermal contact with soil, and inhalation of particulates assuming standard default RME parameters (USEPA, 1991a). Table 5-8 shows that all HQs and pathway HIs are less than 1 regardless of the exposure pathway. Pathway HIs range from 3×10^{-11} for dermal contact with fugitive dust to 0.03 for incidental ingestion of soil. Table 5-9 presents chemical-specific and cumulative excess lifetime cancer risk estimates for the hypothetical future workers for the same standard default RME scenario via soil ingestion, dermal absorption, and inhalation of particulates assuming standard default exposure data. Pathway facility-specific excess cancer risks are estimated to be 7×10^{-6} for the ingestion pathway, 6×10^{-8} for inhalation, and 1×10^{-14} for the dermal pathway (Table 5-9). The cumulative standard default RME facility-specific excess lifetime cancer risk for the hypothetical future worker is estimated to be 7×10^{-6} (Table 5-10). Ninety-nine percent of this risk is attributable to incidental ingestion of soil, while one percent is associated with inhalation of resuspended dust. Dermal contact with soil was a minor pathway of exposure. It should be emphasized, however, that these risks estimates reflect the assumption that hypothetical future workers would be exposed to site-related contaminants eight hours a day, five days a week, 50 weeks a year, for 25 years.

Table 5-11 presents HQs and pathway HIs for future receptors exposed via incidental ingestion of soil, dermal contact with soil, and inhalation of particulates assuming facility-specific exposure scenario. Table 5-11 shows that all HQs and pathway HIs are less than 1 regardless

of the exposure pathway. Pathway HIs range from 2×10^{-11} for dermal contact with fugitive dust to 0.01 for incidental ingestion of soil. Table 5-12 presents chemical-specific and cumulative excess lifetime cancer risk estimates for hypothetical future workers via soil ingestion, dermal absorption, and inhalation of particulates assuming facility-specific exposure scenario. Pathway facility-specific excess cancer risks are estimated to be 6×10^{-7} for the ingestion pathway, 2×10^{-8} for inhalation, and 3×10^{-15} for the dermal pathway (Table 5-11). The cumulative facility-specific excess lifetime cancer risk for the hypothetical future worker is estimated to be 6×10^{-7} (Table 5-10). Ninety-seven percent of this risk is attributable to incidental ingestion of soil, while 3% is associated with inhalation of resuspended dust. Dermal contact with soil was a minor pathway of exposure.

5.4 Risks Associated With Future Average Exposures

Average risks were calculated for the hypothetical future worker assumed to work on-site for 25 years, since the RME cumulative risk estimates for these two receptor groups exceeded 1×10^{-6} (risk = 7×10^{-6}). Average risks were not calculated for all current receptors and for future workers assumed to be exposed using facility-specific assumptions, since risk estimates for all of these receptor groups were less than 1×10^{-6} . Similarly, average HQs and pathway HIs were not calculated, since HIs for all receptor groups were less than unity.

Average risks were calculated using the appropriate mean (depending on whether the data for a given chemical were lognormally or normally distributed) concentration of COPCs in soil facility-wide ($n = 20$) and COPCs in fugitive dust facility-wide ($n = 20$). In addition, for the dermal pathway, an average adherence factor of 0.2 was used (EPA, 1992b). Finally, all chromium measured in facility soils was assumed to be Cr^{+3} . Cumulative average excess cancer risks are presented in Table 5-13 for the hypothetical future worker. Pathway risk estimates for the hypothetical future worker assumed to be on-site 8 hours/day, 5 days/week, 250 days/year, for 25 years were 2×10^{-19} for dermal contact with fugitive dust, 6×10^{-9} for inhalation of particulates, and 3×10^{-6} for incidental ingestion of soil (Table 5-13). The cumulative average excess lifetime cancer risk for these hypothetical future workers is estimated to be 3×10^{-6} .

Pathway risk estimates for the current remediation worker were 3×10^{-8} for dermal contact with soil, 4×10^{-10} for inhalation of particulates, and 2×10^{-6} for incidental ingestion of soil (Table 5-12). The cumulative average excess lifetime cancer risk for these hypothetical future workers is estimated to be 2×10^{-6} .

TABLE 5-1 (REVISED)
CHEMICAL-SPECIFIC HAZARD QUOTIENTS AND CUMULATIVE HAZARD INDICES
FOR ALL THREE CURRENT RECEPTORS EXPOSED VIA INCIDENTAL INGESTION
OF SOIL ASSUMING REASONABLE MAXIMUM EXPOSURES

Chemical	On-Site Security Worker ^a	On-Site Incineration Worker ^a	On-Site Remediation Worker ^a
METALS			
Antimony	0.004	0.007	0.05
Beryllium	2×10^{-5}	5×10^{-5}	3×10^{-4}
Cadmium	0.004	0.007	0.05
Chromium (total)	6×10^{-5}	1×10^{-4}	8×10^{-5}
Chromium VI ^b	1×10^{-4}	2×10^{-4}	4×10^{-4}
Copper	8×10^{-5}	2×10^{-4}	0.001
Lead	NA ^c	NA	NA
Mercury	3×10^{-5}	6×10^{-5}	4×10^{-4}
Selenium	2×10^{-5}	4×10^{-5}	4×10^{-4}
Silver	4×10^{-5}	7×10^{-5}	5×10^{-4}
Zinc	3×10^{-5}	7×10^{-5}	5×10^{-4}
ORGANICS			
Benzo(a)anthracene	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA
Chrysene	NA	NA	NA
1,1-dichloroethylene	6×10^{-8}	1×10^{-7}	9×10^{-7}
Fluoranthene	3×10^{-6}	5×10^{-6}	6×10^{-6}
Hexachlorobenzene	5×10^{-5}	1×10^{-4}	7×10^{-4}
Indeno(1,2,3-cd)pyrene	NA	NA	NA
Methylene chloride	4×10^{-9}	8×10^{-9}	6×10^{-8}
Phenanthrene	NA	NA	NA
Pyrene	2×10^{-5}	4×10^{-5}	7×10^{-6}
PATHWAY III	0.008	0.01	0.1

^a Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in surface soils inside the fence only (n = 11).

^b Chromium VI was assumed to be 1% of total chromium measured (see Section 5.1).

^c An oral reference dose is not available for that chemical; hence, a hazard quotient cannot be calculated.

TABLE 5-2 (REVISED)
CHEMICAL-SPECIFIC HAZARD QUOTIENTS AND CUMULATIVE HAZARD INDICES
FOR ALL THREE CURRENT RECEPTORS EXPOSED VIA DERMAL CONTACT WITH
SOIL ASSUMING REASONABLE MAXIMUM EXPOSURES

Chemical	On-Site Security Worker ^a	On-Site Incineration Worker ^a	On-Site Remediation Worker ^b
METALS			
Antimony	1×10^{-11}	1×10^{-11}	0.008
Beryllium	7×10^{-14}	7×10^{-14}	5×10^{-5}
Cadmium	4×10^{-12}	4×10^{-12}	0.008
Chromium (total)	3×10^{-13}	3×10^{-13}	1×10^{-5}
Chromium VI ^c	6×10^{-13}	6×10^{-13}	6×10^{-5}
Copper	3×10^{-13}	3×10^{-13}	2×10^{-4}
Lead	NA ^d	NA	NA
Mercury	2×10^{-13}	2×10^{-13}	6×10^{-5}
Selenium	5×10^{-14}	5×10^{-14}	4×10^{-5}
Silver	1×10^{-13}	1×10^{-13}	8×10^{-5}
Zinc	3×10^{-13}	3×10^{-13}	7×10^{-5}
ORGANICS			
Benzo(a)anthracene	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA
Chrysene	NA	NA	NA
1,1-dichloroethylene	7×10^{-13}	7×10^{-13}	7×10^{-6}
Fluoranthene	2×10^{-13}	2×10^{-13}	4×10^{-6}
Hexachlorobenzene	3×10^{-12}	3×10^{-12}	6×10^{-4}
Indeno(1,2,3-cd)pyrene	NA	NA	NA
Methylene chloride	6×10^{-16}	6×10^{-16}	5×10^{-7}
Phenanthrene	NA	NA	NA
Pyrene	2×10^{-13}	2×10^{-13}	6×10^{-6}
PATHWAY III	2×10^{-11}	2×10^{-11}	0.02

^a Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in fugitive dust facility wide (n = 20).

^b Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in surface soils inside the fence only (n = 11).

^c Chromium VI was assumed to be 1% of total chromium measured (see Section 5.1).

^d An oral reference dose is not available for that chemical; hence, a hazard quotient cannot be calculated.

TABLE 5-3 (REVISED)
CUMULATIVE HAZARD INDEX VALUES FOR ALL THREE
CURRENT RECEPTORS AND ALL COMPLETE EXPOSURE PATHWAYS
ASSUMING REASONABLE MAXIMUM EXPOSURES

	Pathway Hazard Index for the Current On-Site Security Worker	Pathway Hazard Index for the Current On-Site Incineration Worker	Pathway Hazard Index for the Current On-Site Remediation Worker
PATHWAY			
Incidental Ingestion of Soil ^a	0.008 (>99%)*	0.01 (>99%)	0.1 (>83%)
Dermal Contact with Soil ^c	2×10^{-11} (<1%)	2×10^{-11} (<1%)	0.02 (17%)
Inhalation of Particulates ^d	8×10^{-7} (<1%)	8×10^{-7} (<1%)	1×10^{-6} (<1%)
CUMULATIVE HAZARD INDEX	0.008	0.01	0.1

^a Percent contribution of that pathway to cumulative risk.

^b See Table 5-1.

^c See Table 5-2.

^d See Section 5-2.

TABLE 5-4 (REVISED)
CHEMICAL-SPECIFIC AND CUMULATIVE EXCESS LIFETIME CANCER RISK
ESTIMATES FOR ALL THREE CURRENT RECEPTOR GROUPS EXPOSED VIA
INCIDENTAL INGESTION OF SOIL ASSUMING REASONABLE MAXIMUM
EXPOSURES

Chemical	On-Site Security Worker ^a	On-Site Incineration Worker ^a	On-site Remediation Worker ^a
METALS			
Antimony	NA ^b	NA	NA
Beryllium	6×10^{-8}	1×10^{-7}	1×10^{-7}
Cadmium	NA	NA	NA
Chromium (total)	NA	NA	NA
Chromium VI ^c	NA	NA	NA
Copper	NA	NA	NA
Lead	NA	NA	NA
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Zinc	NA	NA	NA
ORGANICS			
Benzo(a)anthracene	8×10^{-9}	2×10^{-8}	2×10^{-8}
Benzo(a)pyrene	2×10^{-7}	3×10^{-7}	1×10^{-7}
Benzo(b)fluoranthene	8×10^{-9}	2×10^{-8}	1×10^{-8}
Benzo(k)fluoranthene	8×10^{-9}	2×10^{-8}	1×10^{-8}
Chrysene	1×10^{-10}	3×10^{-10}	1×10^{-10}
1,1-Dichloroethylene	4×10^{-11}	7×10^{-11}	7×10^{-11}
Fluoranthene	NA	NA	NA
Hexachlorobenzene	8×10^{-9}	1×10^{-8}	1×10^{-8}
Indeno(1,2,3-cd)pyrene	5×10^{-8}	1×10^{-7}	1×10^{-8}
Methylene chloride	2×10^{-13}	4×10^{-13}	4×10^{-13}
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
PATHWAY RISK	3×10^{-7}	6×10^{-7}	3×10^{-7}

^a Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in surface soils inside the fence only (n = 11).

^b An oral slope factor is not available for that chemical; hence, a risk estimate cannot be calculated.

^c Chromium VI was assumed to be 1% of total chromium measured (see Section 5.1).

TABLE 5-5 (REVISED)
CHEMICAL-SPECIFIC AND CUMULATIVE EXCESS LIFETIME CANCER RISK
ESTIMATES FOR ALL THREE CURRENT RECEPTOR GROUPS EXPOSED VIA
DERMAL CONTACT WITH SOIL ASSUMING REASONABLE MAXIMUM EXPOSURES

Chemical	On-Site Security Worker ^a	On-Site Incineration Worker ^a	On-site Remediation Worker ^b
METALS			
Antimony	NA ^c	NA ^b	NA
Beryllium	2×10^{-16}	2×10^{-16}	2×10^{-8}
Cadmium	NA	NA	NA
Chromium (total)	NA	NA	NA
Chromium VI ^d	NA	NA	NA
Copper	NA	NA	NA
Lead	NA	NA	NA
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Zinc	NA	NA	NA
ORGANICS			
Benzo(a)anthracene	6×10^{-16}	6×10^{-16}	2×10^{-8}
Benzo(a)pyrene	1×10^{-15}	1×10^{-15}	1×10^{-7}
Benzo(b)fluoranthene	3×10^{-16}	3×10^{-16}	2×10^{-8}
Benzo(k)fluoranthene	2×10^{-16}	2×10^{-16}	1×10^{-8}
Chrysene	2×10^{-18}	2×10^{-18}	1×10^{-10}
1,1-Dichloroethylene	4×10^{-19}	4×10^{-19}	5×10^{-10}
Fluoranthene	NA	NA	NA
Hexachlorobenzene	5×10^{-16}	5×10^{-16}	1×10^{-8}
Indeno(1,2,3-cd)pyrene	3×10^{-16}	3×10^{-16}	1×10^{-8}
Methylene chloride	3×10^{-20}	3×10^{-20}	3×10^{-12}
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
PATHWAY RISK	3×10^{-15}	3×10^{-15}	2×10^{-7}

^a Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in fugitive dust facility wide (n = 20).

^b Assumed to be exposed to the upper-bound or maximum (whichever was lower) concentration of COPCs in surface soils inside the fence only (n = 11).

^c An oral cancer slope factor is not available for that chemical; hence, a risk estimate cannot be calculated.

^d Chromium VI was assumed to be 1% of total chromium measured (see Section 5.1).

TABLE 5-6 (REVISED)
CHEMICAL-SPECIFIC AND CUMULATIVE EXCESS LIFETIME CANCER RISK
ESTIMATES FOR ALL THREE CURRENT RECEPTOR GROUPS EXPOSED VIA
INHALATION OF PARTICULATES ASSUMING REASONABLE MAXIMUM
EXPOSURES

Chemical	On-Site Security Worker	On-Site Incineration Worker	On-Site Remediation Worker
METALS			
Antimony	NA ^a	NA	NA
Beryllium	5×10^{-10}	5×10^{-10}	8×10^{-11}
Cadmium	3×10^{-9}	3×10^{-9}	6×10^{-10}
Chromium (total)	NA	NA	NA
Chromium VI ^b	2×10^{-8}	2×10^{-8}	3×10^{-9}
Copper	NA	NA	NA
Lead	NA	NA	NA
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Zinc	NA	NA	NA
ORGANICS			
Benzo(a)anthracene	1×10^{-10}	1×10^{-10}	2×10^{-11}
Benzo(a)pyrene	3×10^{-10}	3×10^{-10}	6×10^{-11}
Benzo(b)fluoranthene	6×10^{-11}	6×10^{-11}	1×10^{-11}
Benzo(k)fluoranthene	5×10^{-11}	5×10^{-11}	8×10^{-12}
Chrysene	5×10^{-13}	5×10^{-13}	8×10^{-14}
1,1-Dichloroethylene	3×10^{-14}	3×10^{-14}	6×10^{-15}
Fluoranthene	NA	NA	NA
Hexachlorobenzene	4×10^{-10}	4×10^{-10}	7×10^{-11}
Indeno(1,2,3-cd)pyrene	5×10^{-11}	5×10^{-11}	9×10^{-12}
Methylene chloride	2×10^{-13}	2×10^{-13}	3×10^{-14}
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
PATHWAY RISK	2×10^{-8}	2×10^{-8}	4×10^{-9}

^a An inhalation cancer slope factor is not available for that chemical; hence, a risk estimates could not be calculated;

^b Chromium VI was assumed to be 1% of total chromium measured (see Section 5.1).

TABLE 5-7 (REVISED)
CUMULATIVE EXCESS LIFETIME CANCER RISKS FOR ALL THREE CURRENT
RECEPTOR GROUPS AND COMPLETE EXPOSURE PATHWAYS
ASSUMING REASONABLE MAXIMUM EXPOSURES

	Pathway Risk Estimate for the Current On-Site Security Worker	Pathway Risk Estimate for the Current On-Site Incineration Worker	Pathway Risk Estimate for the Current On-Site Remediation Worker
PATHWAY			
Incidental Ingestion of Soil ^b	3×10^{-7} (94%) ^a	6×10^{-7} (97%)	3×10^{-7} (91%)
Dermal Contact with Soil ^c	3×10^{-15} (<1%)	3×10^{-15} (<1%)	2×10^{-7} (9%)
Inhalation of Particulates ^d	2×10^{-8} (6%)	2×10^{-8} (3%)	4×10^{-9} (<1%)
CUMULATIVE RISK	3×10^{-7}	6×10^{-7}	5×10^{-7}

^a Percent contribution of that pathway to cumulative risk.

^b See Table 5-4.

^c See Table 5-5.

^d See Table 5-6.

TABLE 5-8 (REVISED)
CHEMICAL-SPECIFIC HAZARD QUOTIENTS AND CUMULATIVE HAZARD INDICES
FOR THE HYPOTHETICAL FUTURE WORKER USING STANDARD DEFAULT RME
SCENARIO^a

Chemical	Incidental Ingestion Of Soil	Dermal Contact with Soil	Inhalation of Particulates
METALS			
Antimony	0.02	1×10^{-11}	NA ^b
Beryllium	2×10^{-4}	7×10^{-14}	NA
Cadmium	0.008	4×10^{-12}	NA
Chromium (total)	7×10^{-4}	3×10^{-13}	NA
Chromium VI ^c	0.001	6×10^{-13}	NA
Copper	6×10^{-4}	3×10^{-13}	NA
Lead	NA	NA	NA
Mercury	4×10^{-4}	2×10^{-13}	8×10^{-7}
Selenium	1×10^{-4}	5×10^{-14}	NA
Silver	2×10^{-4}	1×10^{-13}	NA
Zinc	7×10^{-4}	3×10^{-13}	NA
ORGANICS			
Benzo(a)anthracene	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA
Chrysene	NA	NA	NA
1,1-Dichloroethylene	3×10^{-7}	7×10^{-15}	NA
Fluoranthene	3×10^{-5}	2×10^{-13}	NA
Hexachlorobenzene	0.001	3×10^{-12}	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA
Methylene chloride	3×10^{-8}	6×10^{-16}	1×10^{-12}
Phenanthrene	NA	NA	NA
Pyrene	2×10^{-4}	2×10^{-13}	NA
PATHWAY III	0.03	3×10^{-11}	8×10^{-7}

^a Hypothetical future workers were assumed to be exposed 8 hours/day, 5 days/week, 250 days/year, for 25 years (EPA, 1991a). Future workers were assumed to be exposed to COPCs in surface soil samples collected facility-wide (n = 20).

^b An oral reference dose is not available for that chemical; hence, a hazard quotient cannot be calculated.

^c Chromium VI was assumed to be 1% total measured chromium (see Section 5.1).

TABLE 5-9 (REVISED)
CHEMICAL-SPECIFIC AND CUMULATIVE EXCESS LIFETIME CANCER RISK
ESTIMATES FOR THE HYPOTHETICAL FUTURE WORKER USING STANDARD
DEFAULT RME SCENARIO^a

Chemical	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates
METALS			
Antimony	NA ^b	NA	NA
Beryllium	1×10^{-6}	6×10^{-16}	1×10^{-9}
Cadmium	NA	NA	1×10^{-8}
Chromium (total)	NA	NA	NA
Chromium VI ^c	NA	NA	5×10^{-8}
Copper	NA	NA	NA
Lead	NA	NA	NA
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Zinc	NA	NA	NA
ORGANICS			
Benzo(a)anthracene	2×10^{-7}	2×10^{-15}	4×10^{-10}
Benzo(a)pyrene	4×10^{-6}	4×10^{-15}	9×10^{-10}
Benzo(b)fluoranthene	3×10^{-7}	9×10^{-16}	2×10^{-10}
Benzo(k)fluoranthene	3×10^{-7}	7×10^{-16}	1×10^{-10}
Chrysene	9×10^{-9}	7×10^{-18}	1×10^{-12}
1,1-Dichloroethylene	6×10^{-10}	1×10^{-17}	1×10^{-13}
Fluoranthene	NA	NA	NA
Hexachlorobenzene	6×10^{-7}	1×10^{-15}	1×10^{-9}
Indeno(1,2,3-cd)pyrene	1×10^{-6}	1×10^{-15}	1×10^{-10}
Methylene chloride	4×10^{-12}	1×10^{-19}	6×10^{-13}
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
PATHWAY RISK	7×10^{-6}	1×10^{-14}	6×10^{-8}

- ^a Hypothetical future workers were assumed to be exposed 8 hours/day, 5 days/week, 250 days/year, for 25 years (EPA, 1991a). Future workers were assumed to be exposed to soil COPCs in surface soils samples collected facility-wide (n = 20).
- ^b An slope factor is not available for that chemical; hence, a cancer risk estimate cannot be calculated.
- ^c Chromium VI was assumed to be 1% of total measured chromium (see Section 5.1).

TABLE 5-10 (REVISED)
CUMULATIVE EXCESS LIFETIME CANCER RISKS FOR FUTURE
WORKERS AND COMPLETE EXPOSURE PATHWAYS
ASSUMING REASONABLE MAXIMUM EXPOSURES

	Pathway Risk Estimate for the Worker Using Site- Specific Exposure Data	Pathway Risk Estimate for the Future Worker Using Standard Default Exposure Data ^a
PATHWAY		
Incidental Ingestion of Soil	6×10^{-7} (97%) ^b	7×10^{-6} (99%)
Dermal Contact with Soil	3×10^{-13} (<1%)	1×10^{-14} (<1%)
Inhalation of Particulates	2×10^{-8} (3%)	6×10^{-8} (1%)
CUMULATIVE RISK	6×10^{-7}	7×10^{-6}

^a See Table 5-9.

^b See Table 5-11.

^b Percent contribution of that pathway to cumulative risk.

TABLE 5-11 (REVISED)
CHEMICAL-SPECIFIC HAZARD QUOTIENTS AND CUMULATIVE HAZARD INDICES
FOR THE HYPOTHETICAL FUTURE WORKER USING FACILITY-SPECIFIC
EXPOSURE ASSUMPTIONS^a

Chemical	Incidental Ingestion Of Soil	Dermal Contact with Soil	Inhalation of Particulates
METALS			
Antimony	0.006	1×10^{-11}	NA ^b
Beryllium	4×10^{-5}	7×10^{-14}	NA
Cadmium	0.002	4×10^{-12}	NA
Chromium (total)	2×10^{-4}	3×10^{-13}	NA
Chromium VI ^c	8×10^{-5}	6×10^{-13}	NA
Copper	2×10^{-4}	3×10^{-13}	NA
Lead	NA	NA	NA
Mercury	1×10^{-4}	2×10^{-13}	8×10^{-7}
Selenium	3×10^{-5}	5×10^{-14}	NA
Silver	6×10^{-5}	1×10^{-13}	NA
Zinc	2×10^{-4}	3×10^{-13}	NA
ORGANICS			
Benzo(a)anthracene	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA
Chrysene	NA	NA	NA
1,1-Dichloroethylene	7×10^{-8}	7×10^{-15}	NA
Fluoranthene	7×10^{-6}	2×10^{-13}	NA
Hexachlorobenzene	4×10^{-4}	3×10^{-12}	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA
Methylene chloride	7×10^{-9}	6×10^{-16}	1×10^{-12}
Phenanthrene	NA	NA	NA
Pyrene	4×10^{-5}	2×10^{-13}	NA
PATHWAY III	0.01	2×10^{-11}	8×10^{-7}

^a Hypothetical future workers were assumed to be exposed 8 hours/day, 5 days/week, 250 days/year, for 8 years. Future workers were assumed to be exposed to COPCs in surface soil samples collected facility-wide (n = 20).

^b An oral reference dose is not available for that chemical; hence, a hazard quotient cannot be calculated.

^c Chromium VI was assumed to be 1% total measured chromium (see Section 5.1).

TABLE 5-12 (REVISED)
CHEMICAL-SPECIFIC AND CUMULATIVE EXCESS LIFETIME CANCER RISK
ESTIMATES FOR THE HYPOTHETICAL FUTURE WORKER USING FACILITY-SPECIFIC
EXPOSURE ASSUMPTIONS^a

Chemical	Incidental Ingestion of Soil	Dermal Contact with Soil	Inhalation of Particulates
METALS			
Antimony	NA ^b	NA	NA
Beryllium	1×10^{-7}	2×10^{-16}	5×10^{-10}
Cadmium	NA	NA	3×10^{-9}
Chromium (total)	NA	NA	NA
Chromium VI ^c	NA	NA	2×10^{-8}
Copper	NA	NA	NA
Lead	NA	NA	NA
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Zinc	NA	NA	NA
ORGANICS			
Benzo(a)anthracene	2×10^{-8}	6×10^{-16}	1×10^{-10}
Benzo(a)pyrene	3×10^{-7}	1×10^{-15}	3×10^{-10}
Benzo(b)fluoranthene	2×10^{-8}	3×10^{-15}	6×10^{-11}
Benzo(k)fluoranthene	2×10^{-8}	2×10^{-16}	5×10^{-11}
Chrysene	7×10^{-10}	2×10^{-18}	5×10^{-13}
1,1-Dichloroethylene	4×10^{-11}	4×10^{-18}	3×10^{-14}
Fluoranthene	NA	NA	NA
Hexachlorobenzene	5×10^{-8}	5×10^{-16}	4×10^{-10}
Indeno(1,2,3-cd)pyrene	1×10^{-7}	3×10^{-16}	5×10^{-11}
Methylene chloride	3×10^{-13}	3×10^{-20}	2×10^{-13}
Phenanthrene	NA	NA	NA
Pyrene	NA	NA	NA
PATHWAY RISK	6×10^{-7}	3×10^{-15}	2×10^{-8}

^a Hypothetical future workers were assumed to be exposed 8 hours/day, 5 days/week, 250 days/year, for 8 years. Future workers were assumed to be exposed to COPCs in surface soil facility-wide (n = 20).

^b An slope factor is not available for that chemical; hence, a cancer risk estimate cannot be calculated.

^c Chromium VI was assumed to be 1% of total measured chromium (see Section 5.1).

TABLE 5-13 (REVISED)
CUMULATIVE EXCESS LIFETIME CANCER RISKS FOR FUTURE WORKERS
ASSUMING AVERAGE EXPOSURE CONDITIONS

	Pathway Risk Estimate for the Future Worker Using Standard Default Exposure Data
PATHWAY	
Incidental Ingestion of Soil	3×10^{-6} (> 99%)
Dermal Contact with Soil	2×10^{-19} (< 1%)
Inhalation of Particulates	6×10^{-9} (< 1%)
CUMULATIVE RISK	3×10^{-6}

^a Percent contribution of that pathway to cumulative risk.

CHEMWASTE BASELINE RISK ASSESSMENT - VERSION II

CONCENTRATION OF METALS IN SURFACE SOILS SITE-WIDE (µg/kg micrograms per kilogram)

- DATA FROM VALIDATION REPORTS (APPENDIX N) WERE GIVEN PRIMACY.
- ETC ORIGINAL LABORATORY REPORTS WERE CONSULTED FOR RESOLUTION OF BMDL VALUES.
- BMDL VALUES WERE ASSUMED TO BE EQUAL TO ONE-HALF THE SAMPLE QUANTITATION LIMIT.
- NON-DETECTS EQUAL TO ONE-HALF THE SQL (µg/kg = micrograms per kilogram)

	Antimony	Arsenic	Berylliu	Cadmiu	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
SS-1	3500	5900	1200	4000	110000	43000	120000	120	20000	600	1200	600	251000
SS-2	3400	1100	2000	13000	968000	32000	39000	110	12000	1450	3500	550	67000
SS-3	23000	2600	1300	12000	1060000	36000	43000	47	26000	600	3300	600	81000
SS-4	3750	1300	1600	12000	1320000	52000	32000	50	12000	1600	3000	650	67000
SS-5	22000	2500	1300	12000	740000	44000	92000	110	14000	900	2400	1200	110000
SS-6	9500	7200	1500	4700	184000	49000	260000	150	24000	345	700	700	481000
SS-7	4700	30000	990	4200	92000	60000	200000	260	32000	390	800	800	220000
SS-8	5000	5100	710	2500	34000	34000	120000	160	19000	850	850	850	150000
SS-9	4150	15000	850	3400	44000	67000	140000	230	33000	700	700	700	514000
SS-10	3750	5400	1900	1700	27000	23000	44000	110	17000	315	650	650	81000
SS-14	19000	2100	1300	12000	864000	38000	48000	120	11000	550	2700	550	92000
SS-15	22000	1100	1400	10000	1060000	35000	41000	120	140000	550	3400	550	100000
SS-16	3450	1200	1500	55700	600000	78000	68000	46	71000	1450	3700	600	110000
SS-17	3550	3700	3400	3800	126000	43000	100000	150	17000	1500	600	600	220000
SS-18	9100	22000	2000	12000	803000	44000	66000	440	13000	600	2300	600	130000
SS-19	3650	18000	860	3300	42000	54000	290000	540	26000	1550	600	600	293000
SS-20	3550	4400	360	1500	8900	15000	11000	47	15000	295	600	600	40000
SS-21	3600	600	270	540	29000	16000	45000	250	7500	300	600	600	82000
SS-22	90000	4300	690	5000	157000	54000	1260000	130	11000	335	650	650	1570000
SS-23	5500	9600	2000	4300	57000	32000	270000	230	13000	440	900	900	744000
Min	3400.0	600.0	270.0	540.0	8900.0	15000.0	11000.0	46.0	7500.0	295.0	600.0	550.0	40000.0
Max	90000.0	30000.0	3400.0	55700.0	1320000.0	78000.0	1260000.0	540.0	140000.0	1600.0	3700.0	1200.0	1570000
Mean	12307.5	7155.0	1356.5	8882.0	416295.0	42450.0	164450.0	171.0	26675.0	766.0	1657.5	677.5	270150.0
STD	19616.7	8006.5	708.0	11835.5	450975.4	15925.7	271412.4	128.2	30030.8	472.6	1206.6	156.8	356334.4
n	20	20	20	20	20	20	20	20	20	20	20	20	20
UCL	19891.6	10250.4	1630.2	13457.8	590649.4	48607.1	269382.4	220.6	38285.4	948.7	2124.0	738.1	407914.7
%DET	85	100	100	100	100	100	100	90	100	60	100	30	100

CONCENTRATION OF ORGANICS IN SITE SURFACE SOILS SITE-WIDE (µg/kg)

- DATA FROM VALIDATION REPORTS (APPENDIX N) WERE GIVEN PRIMACY.
- ETC ORIGINAL LABORATORY REPORTS WERE CONSULTED FOR RESOLUTION OF BMDL VALUES.
- BMDL VALUES WERE ASSUMED TO BE EQUAL TO ONE-HALF THE SAMPLE QUANTITATION LIMIT.
- NON-DETECTS EQUAL TO ONE-HALF THE SQL (µg/kg = micrograms per kilogram)

	BA	BaP	B(b)Fl	B(k)Fl	Chrysene	Flourant	HCb	I(123)P	Phenanthrene	Pyrene	MC	BEHP	Di-n-BP	1,1-DCE	TCE
SS-1	1744	1450	2800	1450	1730	2910	1100	2150	1910	2480	1.65	6000	3209	1.65	1.1
SS-2	220	140	255	140	303	373	110	210	289	351	1.6	335	1680	1.6	1.1
SS-3	404	305	606	314	524	833	115	220	1330	1010	1.65	276	2020	18.5	1.98
SS-4	495	463	916	386	620	804	120	230	398	769	1.75	650	4000	1.75	1.2
SS-5	1020	998	1240	762	1250	1960	275	529	1020	2010	1.65	302	1530	1.7	1.1
SS-6	5500	1700	3300	1700	2360	4120	1300	2550	3180	3410	1.9	7000	7080	1.9	1.3
SS-7	6000	1950	3750	1950	1950	2640	1500	2900	2400	2200	2.2	8000	2440	2.2	1.5
SS-8	4500	2100	7550	2100	5770	9380	1600	3100	7733	7750	2.35	8500	850	R	R
SS-9	2068	1700	3300	1700	2530	5320	1300	2550	4082	4520	1.9	8400	793	1.9	1.3
SS-10	4900	1550	3000	1550	1550	1740	3100	2300	3400	2050	1.75	6500	6500	1.75	3.7
SS-14	195	145	275	145	264	354	110	215	194	332	1.6	325	1130	1.6	1.1
SS-15	445	140	251	140	219	244	110	210	124	211	1.6	295	1750	14.3	1.1
SS-16	261	328	448	145	374	489	110	215	234	425	11	329	2120	1.6	1.1
SS-17	1040	1280	2450	1090	1230	1720	110	914	1010	1560	1.65	600	1810	1.65	1.1
SS-18	4600	1450	3360	1740	1740	1282	1100	2580	1410	1576	1.65	7200	2588	1.65	1.1
SS-19	3630	2760	3700	2230	4100	7870	132	2250	5012	6570	3.95	7200	1230	1.7	1.15
SS-20	550	170	330	170	170	150	130	255	370	132	1.9	720	1340	1.9	1.3
SS-21	4650	1500	2940	1500	1500	1300	1150	2200	19105	2250	1.65	6000	6000	1.65	1.15
SS-22	2590	1650	3200	1650	2800	5070	1250	2450	5100	4000	1.85	404000	3600	5	1.25
SS-23	2650	2175	4200	2200	3000	6070	1650	3250	6120	5180	2.45	9000	3320	2.45	1.65
Min	195.0	140.0	251.0	140.0	170.0	150.0	110.0	210.0	124.0	132.0	1.6	276.0	793.0	1.7	1.1
Max	6000.0	2760.0	7550.0	2230.0	5770.0	9380.0	3100.0	3250.0	19105.0	3.0	11.000	404000.0	7080.0	18.5	3.7
Mean	2373.1	1197.7	2393.6	1153.1	1699.2	2731.5	818.6	1563.9	3221.1	2439.3	2.385	24081.6	2749.5	3.5	1.4
STD	2027.1	806.9	1861.9	789.5	1446.5	2705.3	815.1	1183.4	4352.4	2181.4	2.1	89493.9	1865.6	4.7	0.7
n	20	20	20	20	20	20	20	20	20	20	20	20	20	19	19
UCL	3156.80	1509.65	3113.39	1458.35	2258.45	3777.37	1133.73	2021.42	4903.77	3282.68	3.20	58681.40	3470.76	5.38	1.66
%DET	65	30	45	25	75	95	10	10	90	95	11	35	80	10	11

R = Data were judged to be unreliable in the data validation process and were not used in risk calculations.

CONCENTRATION OF METALS IN SURFACE SOILS INSIDE THE FENCE (µg/kg)

- DATA FROM VALIDATION REPORTS (APPENDIX N) WERE GIVEN PRIMACY.
 -- ETC ORIGINAL LABORATORY REPORTS WERE CONSULTED FOR RESOLUTION OF BMDL VALUES.
 -- BMDL VALUES WERE ASSUMED TO BE EQUAL TO ONE-HALF THE SAMPLE QUANTITATION LIMIT.
 -- NON-DETECTS EQUAL TO ONE-HALF THE SQL (µg/kg = micrograms per kilogram)

	Antimony	Arsenic	Berylliu	Cadmiu	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
SS-1	3500	5900	1200	4000	110000	43000	120000	120	20000	600	1200	600	251000
SS-2	3400	1100	2000	13000	968000	32000	39000	110	12000	1450	3500	550	67000
SS-3	23000	2600	1300	12000	1060000	36000	43000	47	26000	600	3300	600	81000
SS-4	3750	1300	1600	12000	1320000	52000	32000	50	12000	1600	3000	650	67000
SS-5	22000	2500	1300	12000	740000	44000	92000	110	14000	900	2400	1200	110000
SS-14	19000	2100	1300	12000	864000	38000	48000	120	11000	550	2700	550	92000
SS-15	22000	1100	1400	10000	1060000	35000	41000	120	140000	550	3400	550	100000
SS-16	3450	1200	1500	55700	600000	78000	68000	46	71000	1450	3700	600	110000
SS-17	3550	3700	3400	3800	126000	43000	100000	150	17000	1500	600	600	220000
SS-20	3550	4400	360	1500	8900	15000	11000	47	15000	295	600	600	40000
SS-21	3600	600	270	540	29000	16000	45000	250	7500	300	600	600	82000
Min	3400.0	600.0	270.0	540.0	8900.0	15000.0	11000.0	46.0	7500.0	295.0	600.0	550.0	40000.0
Max	23000.0	5900.0	3400.0	55700.0	1320000.0	78000.0	120000.0	250.0	140000.0	1600.0	3700.0	1200.0	251000.0
Mean	10072.7	2409.1	1420.9	12412.7	625990.9	39272.7	58090.9	106.4	31409.1	890.5	2272.7	645.5	110909.1
STD	9109.8	1653.8	826.7	15118.3	479489.9	17106.1	33004.4	60.8	40050.5	510.4	1270.5	186.4	65283.2
n	11	11	11	11	11	11	11	11	11	11	11	11	11
UCL	15049.8	3312.6	1872.5	20672.5	887954.7	48618.4	76122.5	139.6	53290.2	1169.3	2966.9	747.3	146575.8

CONCENTRATION OF ORGANICS IN SURFACE SOILS INSIDE THE FENCE (µg/kg)

	BA	BaP	B(b)F1	B(k)F1	Chrysene	Flourant	HCB(a)	I(123)P	Phenanthrene	Pyrene	MC	BEHP	Di-n-BP	1,1-DCE	TCE
SS-1	1744	1450	2800	1450	1730	2910	0	2150	1910	2480	1.65	6000	3209	1.65	1.1
SS-2	220	140	255	140	303	373	0	210	289	351	1.6	335	1680	1.6	1.1
SS-3	404	305	606	314	524	833	0	220	1330	1010	1.65	276	2020	18.5	1.98
SS-4	495	463	916	386	620	804	0	230	398	769	1.75	650	4000	1.75	1.2
SS-5	1020	998	1240	762	1250	1960	275	529	1020	2010	1.65	302	1530	1.7	1.1
SS-14	195	145	275	145	264	354	0	215	194	332	1.6	325	1130	1.6	1.1
SS-15	445	140	251	140	219	244	0	210	124	211	1.6	295	1750	14.3	1.1
SS-16	261	328	448	145	374	489	0	215	234	425	1.1	329	2120	1.6	1.1
SS-17	1040	1280	2450	1090	1230	1720	0	914	1010	1560	1.65	600	1810	1.65	1.1
SS-20	550	170	330	170	170	150	130	255	370	132	1.9	720	1340	1.9	1.3
SS-21	4650	1500	2940	1500	1500	1300	1150	2200	19105	2250	1.65	6000	6000	1.65	1.15
Min	195.0	140.0	251.0	140.0	170.0	150.0	0.0	210.0	124.0	132.0	1.6	276.0	1130.0	1.6	1.1
Max	4650.0	1500.0	2940.0	1500.0	1730.0	2910.0	1150.0	2200.0	19105.0	2480.0	11.0	6000.0	6000.0	18.5	2.0
Mean	1002.2	629.0	1137.4	567.5	744.0	1012.5	141.4	668.0	2362.2	1048.2	2.5	1439.3	2417.2	4.4	1.2
STD	1296.2	560.3	1073.0	541.9	571.5	872.3	345.7	775.6	5582.0	876.8	2.8	2260.4	1455.2	6.0	0.3
n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
UCL	1710.3	935.1	1723.6	863.5	1056.3	1489.0	330.2	1091.8	5411.8	1527.2	4.1	2674.2	3212.2	7.6	1.4

(a) Hexachlorobenzene was not detected in any of the eight samples collected inside the fence.

CONTAMINANTS IN CLAY, PHASE II DATA ONLY, CWMCS CHICAGO INCINERATOR FACILITY

- DATA FROM VALIDATION REPORTS (APPENDIX N) WERE GIVEN PRIMACY.
- ETC ORIGINAL LABORATORY REPORTS WERE CONSULTED FOR RESOLUTION OF BMDL VALUES.
- BMDL VALUES WERE ASSUMED TO BE EQUAL TO ONE-HALF THE SAMPLE QUANTITATION LIMIT.
- NON-DETECTS EQUAL TO ONE-HALF THE SQL ($\mu\text{g/kg}$ = micrograms per kilogram)

Sample	Antimony	Arsenic	Beryll	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc	BEHP	TCE	Phenanth	Di-n-BP
C-4-5	3650	8500	690	3100	18000	21000	10000	49	25000	140	600	600	45000	41500	1.15	330	6910
C-4-15	3750	16000	380	3400	8600	42000	24000	50	29000	310	600	600	50000	650	2.1	340	4090
C-4-40	3350	11000	630	3400	15000	29000	31000	44.5	31000	280	550	550	59000	550	1.05	345	4460
C-6-5	3700	9600	660	3300	17000	32000	16000	49	34000	305	600	600	63000	550	1.14	295	4660
C-6-15	3500	16000	410	3700	8600	46000	23000	47	28000	295	600	600	81000	600	1.1	320	2840
C-6-40	3300	11000	570	3400	14000	34000	16000	44	30000	275	550	550	55000	550	1.05	295	2020
C-2-5	3550	6700	670	2900	17000	26000	13000	47.5	29000	295	600	600	54000	4810	1.1	320	6080
C-2-15	3600	15000	440	3500	9300	50000	20000	48	32000	300	600	600	90000	9410	1.15	429	6580
C-1-5	3650	8000	740	1400	18000	27000	14000	48.5	30000	305	600	600	48000	3870	1.15	325	2620
C-1-15	3850	2900	870	1500	23000	25000	13000	50	35000	325	650	650	56000	7690	1.24	350	4350
C-1-40	3450	11000	580	1900	14000	40000	21000	46	31000	290	600	1200	79000	7750	1.1	310	3070
C-7-15	3550	12000	580	1800	16000	40000	24000	47.5	37000	295	600	1700	66000	10800	1.1	320	4250
C-7-40	3350	8900	720	1800	17000	29000	21000	44.5	30000	280	550	1200	61000	7600	1.05	300	8240
C-3-5	3600	9800	740	1800	17000	49000	23000	48	41000	300	600	600	58000	6140	1.15	320	9540
C-3-15	3500	13000	740	2000	17000	42000	24000	47	40000	295	600	1500	100000	7370	1.1	315	1900
C-3-40	3300	9400	560	1800	13000	38000	21000	44	32000	275	550	550	64000	3870	1.05	295	17600
C-7-5	3650	8200	730	1900	18000	27000	16000	48.5	31000	305	600	600	56000	11000	1.15	330	3970
C-5-5	3600	5100	760	1500	19000	23000	13000	100	27000	300	600	600	48000	6640	1.15	320	3980
C-5-15	3550	18000	610	2000	11000	44000	22000	47.5	34000	295	600	1700	64000	4120	1.1	320	8510
C-5-40	3350	10000	580	1900	14000	34000	20000	44.5	31000	280	550	550	80000	4450	1.05	300	15200
C-2R-5	3650	5800	690	2800	18000	23000	14000	48.5	28000	600	600	600	46000	512	1.15	155	4300
C-2R-15	3800	13000	350	2900	7700	37000	21000	50	23000	1600	650	650	53000	512	3.15	272	2690
C-2R-40	3400	11000	460	7100	10000	36000	49000	45	41000	1400	550	550	53000	337	47.9	264	5810
Min	3300.0	2900.0	350.0	1400.0	7700.0	21000.0	10000.0	44.0	23000.0	140.0	550.0	550.0	45000.0	337.0	1.1	155.0	1900.0
Max	3850.0	18000.0	870.0	7100.0	23000.0	50000.0	49000.0	100.0	41000.0	1600.0	650.0	1700.0	100000.0	41500.0	47.9	429.0	17600.0
Mean	3550.0	10430.4	615.7	2643.5	14791.3	34521.7	20391.3	49.5	31695.7	406.3	591.3	780.4	62130.4	6142.7	3.3	311.7	5811.7
STD	157.4	3673.9	135.6	1238.0	3998.3	8675.3	7975.8	11.2	4704.3	354.1	28.8	382.5	14586.1	8490.3	9.7	46.7	3941.2
n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
UCL	3606.2	11741.9	664.1	3085.4	16218.6	37618.6	23238.5	53.5	33375.0	532.7	601.6	917.0	67337.3	9173.5	6.8	328.4	7218.7
%DET	4	100	100	100	100	100	100	48	100	65	65	74	100		11	39	100

RESULTS OF THE K-S TEST DONE ON A SAMPLE SIZE OF 11 (SAMPLES INSIDE THE FENCE)

Chemical	Parameter Distribution*	Significance Level**	Number Samples	Mean (mg/kg)	Standard Deviation (ug/kg)	H or T statistic	95%UCL for Distribution
Antimon	none	0 (normal)	11	10072.7	9109.79	1.81	15049.75
Antimon	none	0.0 (lognormal)	11	8.827	0.91	2.84	23342.27
Arsenic	lognormal	0.542	11	7.572	0.70	2.47	4285.28
Berylliu	normal	0.099	11	1420.91	826.66	1.81	1872.55
Cadmiu	lognormal	0.052	11	8.848	1.25	3.51	60834.95
Chromiu	normal	0.173	11	625991	479489.88	1.81	887954.72
Copper	normal	0.206	11	39272.7	17106.09	1.81	48618.44
Lead	lognormal	0.422	11	10.8	0.66	2.41	100688.52
Mercury	normal	0.109	11	106.364	60.82	1.81	139.59
Nickel	lognormal	0.107	11	9.91	0.87	2.77	62688.89
Selenium	lognormal	0.173	11	6.623	0.63	2.37	1467.68
Silver	normal	0.461	11	2272.73	1270.51	1.81	2966.85
Thallium	none	0.0 (normal)	11	645.455	186.35	1.81	747.27
Thallium	none	0.0 (lognormal)	11	6.443	0.22	1.88	733.62
Zinc	lognormal	0.128	11	11.485	0.52	2.21	160473.42

RESULTS OF THE K-S TEST DONE ON A SAMPLE SIZE OF 11 (SAMPLES INSIDE THE FENCE)

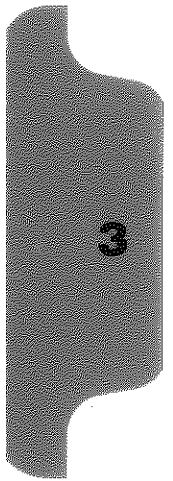
Chemical	Parameter Distribution*	Significance Level**	Number Samples	Mean (mg/kg)	Standard Deviation (mg/kg)	H or T statistic	95%UCL for Distribution
BA	lognormal	0.422	11	6.421	0.96	2.93	2356.72
BaP	lognormal	0.435	11	6.027	0.98	2.98	1699.51
B(b)Fl	lognormal	0.671	11	6.606	0.98	2.98	3016.96
B(k)Fl	lognormal	0.092	11	5.9	0.99	2.99	1515.58
Chrysene	lognormal	0.3	11	6.313	0.83	2.70	1585.98
Fluorant	lognormal	1	11	6.553	0.94	2.89	2567.66
HCB	none	0.0 (normal)	11	312.727	404.64	1.81	533.80
HCB	none	0.0 (lognormal)	11	5.234	0.93	2.87	665.43
I(123)P	none	0.001 (normal)	11	668	775.65	1.81	1091.76
I(123)P	none	0.001 (lognormal)	11	6.024	0.95	2.91	1542.39
Phenanth	lognormal	0.36	11	6.506	1.41	3.87	10211.62
Pyrene	lognormal	0.842	11	6.546	1.02	3.05	3116.32
MC	none	0 (normal)	11	2.518	2.81	1.81	4.06
MC	none	0 (lognormal)	11	0.683	0.57	2.28	3.52
BEHP	none	0 (normal)	11	1439.27	2260.42	1.81	2674.23
BEHP	none	0.014 (lognormal)	11	6.479	1.15	3.31	4207.81
Di-n-BP	lognormal	0.106	11	7.663	0.50	2.18	3400.43
DCE	none	0 (normal)	11	4.355	6.03	1.81	7.65
DCE	none	0 (lognormal)	11	0.929	0.92	2.86	8.94
TCE	none	0.001 (normal)	11	1.212	0.26	1.81	1.36
TCE	none	0.002 (lognormal)	11	0.176	0.18	1.85	1.34

RESULTS OF THE K-S TEST DONE ON A SAMPLE SIZE OF 20 (SAMPLES COLLECTED FACILITY-WIDE)

Chemical	Parameter Distribution*	Significance Level**	Number Samples	Mean (mg/kg)	Standard Deviation (ug/kg)	H or T statistic	95%UCL for Distribution
Antimon	none	0 (normal)	20	12307.5	19616.66	1.73	19891.62
Antimon	none	0.002 (lognormal)	20	8.856	0.93	2.50	18394.24
Arsenic	lognormal	0.933	20	8.328	1.10	2.74	15058.24
Berylliu	normal	0.493	20	1356.5	707.96	1.73	1630.21
Cadmiu	lognormal	0.354	20	8.595	1.01	2.61	16526.90
Chromiu	lognormal	0.055	20	12.044	1.56	3.46	1977241.40
Copper	normal	0.814	20	42450	15925.73	1.73	48607.15
Lead	lognormal	0.61	20	11.397	1.04	2.65	288498.23
Mercury	lognormal	0.081	20	4.91	0.70	2.21	246.75
Nickel	lognormal	0.327	20	9.894	0.68	2.19	35237.46
Selenium	lognormal	0.181	20	6.468	0.60	2.10	1028.77
Silver	none	0 (normal)	20	1657.5	1206.59	1.73	2123.99
Silver	none	0.007 (lognormal)	20	7.15	0.74	2.26	2463.56
Thallium	none	0.001 (normal)	20	677.5	156.84	1.73	738.14
Thallium	none	0.002 (lognormal)	20	6.498	0.20	1.78	733.43
Zinc	lognormal	0.15	20	12.012	0.93	2.50	435219.86

RESULTS OF THE K-S TEST DONE ON A SAMPLE SIZE OF 20 (SAMPLES COLLECTED FACILITY-WIDE)

Chemical	Parameter Distribution*	Significance Level**	Number Samples	Mean (mg/kg)	Standard Deviation (mg/kg)	H or T statistic	95%UCL for Distribution
BA	lognormal	0.299	20	7.243	1.19	2.87	6193.68
BaP	normal	0.12	20	1197.7	806.86	1.73	1509.65
B(b)Fl	normal	0.431	20	2393.55	1861.89	1.73	3113.39
B(k)Fl	none	0.042 (normal)	20	1153.1	789.54	1.73	1458.35
B(k)Fl	none	0 (lognormal)	20	6.631	1.10	2.74	2773.49
Chrysene	normal	0.329	20	1699.2	1446.52	1.73	2258.45
Fluorant	lognormal	1	20	7.342	1.21	2.90	7147.69
HCB	none	0.002 (normal)	20	818.6	815.10	1.73	1133.73
HCB	none	0 (lognormal)	20	6.053	1.28	3.01	2322.52
I(123)P	none	0.004 (normal)	20	1563.9	1183.39	1.73	2021.42
I(123)P	none	0 (lognormal)	20	6.859	1.17	2.85	4070.47
Phenanth	lognormal	0.596	20	7.292	1.40	3.20	10918.64
Pyrene	lognormal	0.132	20	7.292	1.18	2.86	6354.01
MC	none	0 (normal)	20	2.385	2.10	1.73	3.20
MC	none	0 (lognormal)	20	0.719	0.45	1.98	2.79
BEHP	none	0 (normal)	20	24081.6	89493.94	1.73	58681.40
BEHP	none	0.005 (lognormal)	20	7.787	1.91	4.05	87644.44
Di-n-BP	lognormal	1	20	7.722	0.64	2.14	3791.19
DCE	none	0 (normal)	20	3.497	4.66	1.73	5.30
DCE	none	0 (lognormal)	20	0.863	0.73	2.24	4.50
TCE	none	0 (normal)	20	1.383	0.61	1.73	1.62
TCE	none	0 (lognormal)	20	0.27	0.30	1.84	1.55



ATTACHMENT 3

ATTACHMENT III

RESPONSE TO TECHNICAL REVIEW OF
CHEMICAL WASTE MANAGEMENT CHEMICAL SERVICES, INC. (CWMCS)
CHICAGO INCINERATOR FACILITY
FINAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

ECOLOGICAL RISK ASSESSMENT REPORT

GENERAL COMMENTS

1. **Comment:** The report bases its evaluation of risk on analytical results of surface water and sediment samples collected from Lake Calumet. Although sediment sample results are compared to background sample results, surface water and sediment sample results are not compared to results of samples collected in or near on-site solid waste management units (SWMU) to determine whether contaminants in the lake correspond to those detected at the facility. Page 8-6 of the report states that Lake Calumet contaminants may be attributable to other sources. A comparison of the types and concentrations of contaminants in on-site samples should be made in order to further determine which sediment and surface water contaminants may have originated from the CWMCS facility.

CWM Response: This comment is outside the scope of the Ecological Risk Assessment Report. For the purposes of the Ecological Risk Assessment, Lake Calumet sediment samples were divided into two classifications: "Near Pier" and "Lake Calumet" sediment samples.

References are provided on Page 8-6 to support the conclusion that Lake Calumet contaminants may be attributable to other sources.

2. **Comment:** The report states that no federal or state designated threatened or endangered (T or E) plant or animal species are present at the CWMCS facility. The report does not provide a reference for this conclusion. Some on-site plant species are listed and the text states that disturbed on-site soil conditions will inhibit T & E plant species from

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becoming established. However, the report does not explain whether a survey was conducted to determine that T & E plant species are absent. The text should be revised to address these issues.

The report also does not state the rationale for assuming that no T & E bird species have been observed on site. Because T & E bird species are known to nest in and migrate through the Lake Calumet area, information supporting the assumption that no T & E bird species are present on site should be provided. The report also does not address the potential of T & E fish species inhabiting Lake Calumet until the Summary and Conclusions section of the report. This information should be provided in earlier section that discuss T & E species.

CWM Response: CWMCS proposes to revise the text of the ERA to state "that based upon a survey of the facility conducted by Holly Hattermer Frey and Bob Quinlan, Dames & Moore, on September 27, 1993, there were no T & E plant or animal species present on the facility.

3. **Comment:** The report states that the rate of groundwater discharge into Lake Calumet is very slow and that concentrations of chemicals in Lake Calumet and in shallow groundwater are likely to be at steady-state conditions. The report seems to provide these reasons for not including on-site groundwater contaminants as chemicals of potential concern (COPC) in the risk assessment. As stated in PRC's technical review comments on the CWMCS facility's final "Resource Conservation and Recovery Act (RCRA) Facility Investigation" report dated December 10, 1993, the low groundwater flux estimate is based only on data for one monitoring well. The total flux of contaminant discharge to the lake may be significant. The wording of all affected sections of the report should be modified accordingly, and the report should address other COPCs that may be discharged to Lake Calumet in significant concentrations from contaminated groundwater.

CWM Response: The Agency's comment questions the validity of the groundwater model presented in the REPORT. Extensive comments are furnished in the response to Attachment I of the Agency's June 3, 1994 letter. The foregoing comment presupposes that the model is not accurate. The Agency's concerns relative to the model need to be addressed prior to amending the Risk document.

4. **Comment:** The report states that bird species that inhabit wetlands could visit the facility but that they are not expected to be exposed to significant concentrations of

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facility-related contaminants partly because the species do not winter in the facility area. Although this statement may be true, the report does not address potential breeding bird populations such as the black-crowned night heron (*Nycticorax nycticorax*), a state-designated endangered species, which nests in large numbers in a wetland east of the facility. The report should include an evaluation of the feeding habits and locations of this and other bird species that nest in the area.

CWM Response: Insert as a final paragraph to Section 3.1.2 - "Although bird species are not expected to be exposed to significant amounts of facility-related contaminants because of their behavior patterns (i.e., they do not winter in the area, their home range is large relative to the affected area, etc.) certain wetland bird species potentially nest in wetlands located approximately 0.5 miles southeast of the facility. Among these species is the black-crowned night heron (*Nycticorax nycticorax*), which is known to nest in this area (personal communications, Ms. Amelia Orton-Palmer, U.S. Fish & Wildlife Service, Barrington, Illinois).

Text changes: The last sentence of the first paragraph of Section 3.1.2 will be deleted and replaced with the following: "No federally-listed T&E species are known to occur or potentially occur within 5 miles of the facility. However, five candidate species have been observed within 5 miles of the facility. These candidates include five avian species. According to the U.S. Fish & Wildlife Service (letter dated August 5, 1994 to Dames & Moore), the candidate avian species, black tern (*Chlidonias niger*) and common tern (*Sterna hirundo*), have been known to use wetlands within the five-mile radius. An unconfirmed observation by a qualified biologist was made of the candidate avian species, black rail (*Laterallus jamaicensis*), within the five-mile radius. The candidate plant species, *Thismia americana*, was last observed in the area in 1916. Recent searches have not resulted in any observations of this species and the U.S. Fish & Wildlife Service has given it a classification indicating that it may be extinct. The candidate plant species, *Talinum rugospermum* (rough-seeded flameflower), was documented in 1962 as occurring within 5 miles of the facility."

Editorial Note: please note that "Lynnewood Smith" should be "Dr. Linwood Smith" - see second paragraph under Section 3.1.1.

5. **Comment:** One primary exposure route for aquatic receptors, uptake of contaminants across the gill membrane, is addressed in the exposure assessment. Reasons for excluding direct

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ingestion of sediments, dermal contact, and ingestion of prey are provided in Table 3-3 of the report, but no information from scientific literature is presented to support the exclusion of these exposure routes. The report should provide references for the information presented in Table 3-3. In addition, the report states that no "reliable" means exist for modeling potential exposures from the ingestion of prey. This statement is subjective and should be restated or explained in the report.

In addition, the rationale for evaluating the respiratory pathway is unclear. The report states that "aquatic organisms can accumulate chemicals at levels much higher than those measured in the surrounding water or sediment." This rationale does not explain how chemicals become concentrated in the organisms or provide a reference for the statement that respiration is a primary route of exposure. The report should include additional explanation for the reason the respiratory pathway was chosen as the primary route of exposure and include the necessary reference.

CWM Response: "Fishermen have been observed fishing in Lake Calumet near the CWMCS Incinerator facility. These fishermen may come in contact with contaminated sediments while standing on the edge of the lake or as a result of wading into the lake. These receptors may also be exposed to contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993). Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties." Section 3.1.1, CWMCS Supplemental Human Health Risk Assessment Technical Review.

The foregoing reference supports the exclusion of the identified exposure routes.

6. **Comment:** Section 3.4 of the report states that the upper confidence limits (UCL) may exceed the maximum reported concentration of contaminants when data sets are small, and that in these cases, the maximum values instead of UCLs should be used to estimate reasonable maximum exposures (RME). The report does not provide enough information to determine when the maximum values are used in place of UCLs. Maximum concentration values should be added to Table 2-3 with UCLs

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for near-pier sediment data, and the report should discuss the contaminants for which maximum values instead of UCLs are used.

CWM Response: Table 2-3 has been revised to include information on maximum measured values. In addition, the following text will be added to the end of top paragraph on p.3-8. "Table 2-3 shows the 95% UCL and maximum measured values. Since the 95% UCL did not exceed the maximum measured value for any chemicals detected in near-pier sediments, the UCL value was used to evaluate potential risks to ecological receptors for all COPCs."

7. **Comment:** Section 5.0, the introduction to the effects assessment, states that EPA's Ambient Water Quality Criteria (AWQC) may be too stringent to apply to the risk assessment because the sensitive species upon which the AWQCs are partly based may or may not be present near the facility. In cases where contaminant concentrations exceed AWQCs, toxicity quotients were calculated in order to determine whether aquatic organisms may be affected by contaminants. Although this approach may be appropriate, the report does not provide any reference for the absence of sensitive species. If it is not known whether the sensitive species exist in Lake Calumet, the report should be modified to reflect that risk of exposure is possible for contaminants that exceed AWQCs and that the toxicity quotient (TQ) is only possibly a more accurate reflection of risk.

In addition, the explanation of the TQ approach on page 5-2 seems to indicate that the TQ approach was used to eliminate substances as COPCs. PRC infers from the discussion that substances were eliminated if maximum acceptable toxicant concentrations (MATC) were higher than estimated sediment pore water concentrations for contaminants that exceed AWQC or sediment quality criteria (SQC). However, this approach is not explained, and it is apparent from Table 5-6 that such substances are not eliminated as COPCs. The report should be modified to explain the results of the comparison between pore water concentrations and MATCs, where applicable.

CWM Response: Since site-specific biota sampling was not conducted, it is not known for certain if sensitive species currently exist in Lake Calumet. On the other hand, IDENR (1988) reported that in 1981 and 1982, 27 fish species from 10 families were collected from Lake Calumet. Of the species, salmon and trout (*Oncorhynchus* sp.), which are generally considered sensitive, cold water species, were observed. Since these data indicated that Lake Calumet represents suitable habitat for salmon and trout, salmonids were

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identified as a key receptor group of concern for the CWMCS ERA. Hence, sensitive species were represented and accounted for in the ERA.

The TQ approach was not used to eliminate chemicals as COPCs. As stated on p.5-5, TQs were calculated for those chemicals whose upper-bound concentration in pore water or sediment exceeded AWQC or Sediment Quality Criteria, respectively. For sediment COPCs, if the MATC (which is the Toxicity Reference Value referred to in Equation 5-1) is higher than the estimated sediment pore water concentration (which is the exposure concentration referred to in Equation 5-1), then the TQ for that chemical and receptor group would be less than 1. Results of the comparison between pore water concentrations and MATCs (or the TQ results) are presented in Chapter 7.

8. **Comment:** Section 7.1 explains that mean toxicity reference values (TRV) were used to calculate TQs when TQs based on minimum TRVs were equal to or greater than 1. By using this method, mercury and naphthalene are excluded as COPCs. The report states that mean TRVs "represent a more reasonable (typical) toxicological benchmark." Although it is possible that mean values are more reflective of typical conditions, it is not necessarily a more reasonable approach. The wording in the report should be modified to reflect that mean TRVs merely present another benchmark that may or may not be more reasonable. In addition, mercury and naphthalene should be included as COPCs because their concentrations in contaminated media are higher than minimum TRVs.

CWM Response: The following text will be inserted at the end of the first sentence on the top of p.7-4. "...in Tables 5-4 and 5-5. To provide a less conservative portrayal of the potential toxicity of sediment COPCs to aquatic organisms, TQs were calculated using the arithmetic mean TRVs (MATCs) listed in Tables 5-4 and 5-5. Use of the minimum TRV is likely to overestimate the true risk to aquatic receptors, since this approach assumes that all species inhabiting Lake Calumet are equally as sensitive to a given chemical as the most sensitive organism tested. Use of the arithmetic mean TRV better reflects the varying susceptibilities of the various aquatic organisms exposed to facility-related COPCs." The sentence, "Mean TRVs were used, since they represent a more reasonable (typical) toxicological benchmark." will be deleted.

SPECIFIC COMMENTS

1. **Comment:** Section 2.1, Page 2-2, Paragraph 3. The report

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states that contaminants detected in Lake Calumet sediment samples were compared to measured contaminant levels detected in clay samples collected from the CWMCS facility for the purpose of conducting baseline comparisons. Although use of clay sampling results may be the only way to establish background conditions, the report should state that the sediment and clay samples may not be comparable because sediments probably consist of silt, organic matter, and soils with different grain sizes than the clay underlying the facility.

CWM RESPONSE: A difficulty encountered in the investigation was the limited sediment layer in Lake Calumet. In some locations sediment was almost entirely absent and samples were literally scraped from the Lake bed. If the issue is understood, using the clay sample results appears to be a conservative approach. The assumption is that the Lake bed should be in equilibrium with the Lake and sediments would be impacted by industrial activity over the last century.

Additional language will be included in the document concerning the comparison of the clay results.

2. **Comment:** Section 3.1, Page 3-1, Paragraph 1. The report cites EPA's "Framework for Ecological Risk Assessment" to support the statement that "the fundamental unit for ecological risk assessment is generally the population rather than the individual (with the exception of T & E species)." Although the framework describes ecological parameters that relate to populations and states that entire populations can be addressed in the risk assessment, it does not support the generalization made in the facility report. The reference to the framework should be deleted and replaced with an appropriate reference.

CWM Response: The reference Barnhouse and Suter, 1986 will replace USEPA, 1992a.

3. **Comment:** Section 3.4, Page 3-8, Paragraph 2. The last sentence of this paragraph refers to Appendix 1 of the Ecological Risk Assessment report, but no Appendix 1 exists. Appendix A appears to be the correct reference. The report should be revised to correct this inconsistency.

CWM Response: "Appendix 1" will be changed to "Appendix A".

4. **Comment:** Section 4.0, Page 4-1, Paragraph 2. The second bulleted item states that a potential endpoint for the facility is whether water quality in Lake Calumet near the facility is sufficient to support a diverse natural aquatic

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community. To clarify this issue, the report should be reworded to emphasize the question of how large an impact the facility has on the diversity of the aquatic community in Lake Calumet.

CWM Response: The second bullet on p. 4-1 will be reworded as follows. "Is water quality in Lake Calumet near the CWMCS facility sufficient to support a diverse natural aquatic community (i.e., is exposure facility-related COPCs by aquatic organisms existing near the CWMCS facility likely to substantially alter species diversity in Lake Calumet)?"

5. **Comment:** Section 5.3.1, Page 5-6, Paragraph 2. This section discusses the toxicity of toluene but does not provide a list of toluene concentrations detected in surface water samples. A table with this information should be included so that toluene concentrations in surface water can be compared to toluene MATCs.

CWM Response: Information on the mean, maximum, standard deviation, and UCL concentrations for toluene in surface water are listed in Table 3-4. Measured concentrations of toluene in surface water are compared to the MATC for toluene in Table 7-5.

6. **Comment:** Section 5.4.1, Page 5-9, Paragraph 2. The report does not provide a comparison between sediment pore water concentrations of contaminants and MATCs for contaminants that exceed AWQC or SQC. In order to clearly summarize the results of the TQ evaluations, a table providing the pore water concentrations and applicable MATCs should be provided and discussed in this section of the report.

CWM Response: Chapter 5 of the ERA, Effects Assessment, deals with the development of TRVs (MATCs) for the COPCs. TQ results (i.e., comparisons of MATC and sediment pore water concentrations and ambient water data) are included in Chapter 7, Risk Characterization. A statement will be added to the end of Chapter 5 noting that TQ results are presented in the Risk Characterization section.

7. **Comment:** Section 5.5, Page 5-10, Paragraph 1. The report does not provide a discussion of the final list of COPCs, nor does it explain in text that the COPCs are listed in Table 5-6. The text should be revised to discuss the final list of COPCs, including a reference to Table 5-6.

CWM Response: Selection of COPCs for this site is discussed in Section 2.0. The final list of COPCs for surface water and sediment is summarized in Table 2-5. A revised Table 5-6

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(attached) provides a toxicity profile for all COPCs listed in Table 2-5.

8. **Comment:** Section 6.4, Page 6-6, Paragraph 1. The report states that aquatic species are diverse in Lake Calumet and, as a result, the facility may not affect receptor populations. A reference for the statement about species diversity is needed to support the assertion that the facility does not have a significant impact on this aspect of the ecosystem. Although a reference for species diversity is provided elsewhere in the report in Sections 1.3.2 and 8.0, the text does not explain whether the Illinois Department of Energy and Natural Resources (IDENR) report specifically states that species in Lake Calumet are diverse or whether this statement was inferred from the IDENR report during the preparation of the risk assessment. Further explanation of this issue is needed.

CWM Response: The reference IDENR (1988) will be added to the last sentence of paragraph 1, page 6-6 to support the statement that aquatic diversity in Lake Calumet remains diverse. IDENR (1988) states, "A comparison of current species with historical records shows a relative reduction of diversity over time in the lake. The current fish community in Lake Calumet, however, remains diverse. A score of 48 was calculated for the lake based on Karr's Index of Integrity (Karr, 1981) to evaluate the quality of fish fauna. This score is comparable to scores obtained for Fox River and falls within the "good" range (Greenfield and Rogner, 1984)." Reference to IDENR (1988) in Sections 1.3.2 and 8.0 will be revised to clarify that the report specifically states that diversity for Lake Calumet remains diverse.

9. **Comment:** Section 8.0, Page 8-6, Paragraph 3. The report addresses species diversity as a potential indicator that the facility is not affecting the ecosystem of Lake Calumet, but the size of aquatic species populations is not addressed. If populations are low, it is possible that toxicological effects are partly responsible for decreased fecundity. The report should include information about the size of aquatic populations in Lake Calumet.

CWM Response: Information regarding the status of aquatic species within Lake Calumet was obtained from the 1988 Illinois Department of Energy and Natural Resources document. We are not aware of any reports which describe estimates of aquatic populations within Lake Calumet and an investigation as to the abundance of such aquatic populations is beyond the scope of this project. We agree that if population numbers were, in fact, low the toxicity of contaminants or other

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environmental conditions (e.g., low dissolved oxygen) within Lake Calumet could be directly responsible for reduced fecundity or increased mortality. However, if this is a real issue, considering that certain aquatic populations (i.e. fish) are mobile and exposed to a variety of contaminant sources within Lake Calumet, it would be very difficult to determine which contaminant source(s) may be responsible for these effects (e.g., reduced fecundity). Investigations of the fish populations within Lake Calumet is beyond the scope of this evaluation.

10. **Comment:** Section 8.0, Page 8-7, Paragraph 2. The report states that no species exhibit a pattern of acute toxicity, such as large fish kills, but no reference or specific explanation of the basis for this statement is provided. The report should provide a reference for this statement or explain the rationale for this assumption. In addition, the report states that manifestations of acute toxicity caused by elevated metal concentrations in sediment pore water have not been observed. The report does not provide a reference for this statement, and therefore should not include statement without a reference or explanation, particularly because samples of benthic organisms have not been collected to determine the levels of contaminants in potentially affected populations.

CWM Response: The reference to the absence of acute aquatic toxicity (e.g. "large fish kills") was made based on interviews of site personnel. The text will be revised accordingly. Regarding "manifestations of acute toxicity", the last sentence in paragraph 2, page 8-7, "Although results of the effects assessment suggest that chronic effects to benthic organisms are possible, manifestations of acute toxicity caused by elevated metal concentrations have not been observed", will be deleted from the text. We agree that this statement cannot be substantiated since no benthic organisms have been collected and evaluated.

TEXT CHANGES

The second to the last paragraph in Section 8.0 will be revised as follows:

"....toxicity (i.e., large fish kills have not been observed by onsite personnel) suggest that the resulting TQs..."

Also the last sentence of this paragraph will be deleted.



ATTACHMENT 4

ATTACHMENT IV
COMMENTS ON U.S.EPA'S
SUPPLEMENT HUMAN HEALTH RISK ASSESSMENT
TECHNICAL REVIEW

GENERAL COMMENTS:

- 1) The Agency's cover letter transmitting the "CWMCS Supplemental Human Health Risk Assessment Technical Review" (SHHRA) indicated that: "Our review of your January 11, 1994, Human Health Risk Assessment Report have identified a very serious shortcoming." The letter further discusses the Agency's efforts to develop the SHHRA. It follows that the SHHRA addresses the "very serious shortcoming" mentioned but not specifically identified in the Agency's correspondence.

PRC was evidently tasked with preparing a risk assessment for two potential receptors, Subsistence Fishermen and Construction/Utility Workers. Basis for this effort was that the RFI RA apparently did not address these receptors. Comments being furnished with this response will demonstrate that these receptors were adequately addressed in the RFI RA. CWMCS addressed four potential human receptors in the Human Health Risk Assessment:

Facility Workers
Tresspassers
Off-site Residents
Recreational Users of Lake Calumet

Facility workers were further divided into three groups, Remediation, Security and Incineration Workers. Identification of these potential receptors in the CWMCS RFI RA is consistent with the RFI RA Workplan.

PRC's instructions were evidently to address Subsistence Fishermen and Construction/Utility Workers. The basis for this effort was that these receptors were not identified in the RFI RA.

2. An assumption critical to the SHHRA is included in the first paragraph of Section 3.1.2, Page 6. It is assumed that site workers will be exposed to contaminated groundwater in excavations. Further, it was assumed that engineering controls such as pumping may not be effective at reducing exposure.

The failure of engineered controls to reduce exposures is not

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justification for allowing an exposure. This would be in direct violation of OSHA regulations. For further information reference the CWMCS response, Attachment II, General Comment #6.

The assumption that exposure of site workers is an acceptable scenario even though this would be in violation of existing OSHA regulations, invalidates the scenario.

3. The mechanism employed to estimate Exposure Point Concentrations is biased. For example, using the procedure employed for "Undetermined" data in the SHHRA, a facility having a single contaminated area and the balance of the results ND would default to the maximum detected concentration. The maximum detected value would then be used to calculate risk over the entire area. A similar bias exists when the "lognormal" data distribution procedure is applied. If a facility has a single highly contaminated area, the default is to the maximum detected concentration.

Specific to the CWMCS facility, the maximum detected concentrations of 1,1-Dichloroethene (1,1-Dichloroethylene) were used to calculate risk in areas A, B, and C. Within area A, G-332 was reported during Phase I, with a concentration of 358,000 ug/l of 1,1-Dichloroethene and during Phase II, with a concentration of 2240 (BMDL). Less than 50 feet away 1,1-Dichloroethene was reported in FG-10 at 1.4 ug/l (BMDL). The results reported for SS-16 and FG-6, within 100 feet of G-332, were "non-detects".

Due to the extreme variability in the data, when the lognormal data distribution procedure is applied, the 95% UCL of the lognormal distribution is greater than the maximum detected concentration and therefore, the default is to the maximum detected concentration.

A single high concentration, without verification by a second round of sampling, representing approximately 5% of Area A, is considered to be representative of the entire Area A. In the case of 1,1-Dichloroethene, Areas B and C also default to the maximum detected values.

Other constituents have not been evaluated at this time; however, similar over estimations likely exist.

The management of the 1,1-Dichloroethene data must be reviewed based upon the following:

- The facility investigation indicated that perched

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groundwater conditions occur due to the existence of earthen structures (liners from the previous Hyon SWMUs) below grade.

- Analytical results obtained from the individual SWMUs may be indicative of conditions within the SWMU only.
- The default value utilized to calculate risk for 1,1-Dichloroethane was approximately 5 times greater than the next highest result. A significant difference exists between the Phase I and Phase II results obtained from G-332; result of 358,000 ug/l vs 2,240 ug/l (BMDL) in the second round.
- Although the data fits a lognormal distribution, the distribution in this situation is not relevant to conditions at the facility.
- Exposure Point Concentrations calculated in accordance with the procedures in the SHHRA, without consideration for unique circumstances, tend to overestimate risk by orders of magnitude.

In support of the foregoing the Science Advisory Board (1991), see reference included with Attachment II, provides the following:

"Second, in order to calculate a statistical confidence limit for the mean, a particular distributional form must be assumed for the data (e.g., normal, lognormal, or Weibull). There is a priori no reason that sampling data should have a particular distributional form. Different distributional assumptions can sometimes produce quite disparate results.

In some cases, routine application of a standard procedure for calculating an UCL on the mean concentration can produce a pathological result in which the UCL is literally thousands of times larger than the maximum observed value (MOV). In fact, such extreme behavior can even occur when obtaining a point estimate (e.g., MLE estimator) of the mean. When this occurs, it is likely to be due to the fact that one or more of the statistical assumptions are violated, in which case the relationship between the computed UCL and the actual concentrations at the site are likely to be purely coincidental."

In an Air & Waste Management Association publication entitled

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"Assessing Real Human Health Risks in the RCRA Corrective Action Program by Overcoming Common Pitfalls in the Exposure Assessment Process", publication 94-WP75B.03, the following comment is provided:

"As has been shown repeatedly, most environmental and occupational data are highly positively skewed (i.e. Log-normally distributed) and not Gaussian (i.e. normally distributed). This observation is relevant in light of earlier Superfund guidance that called for the use in risk assessments of the 95 percent upper confidence limit (UCL) of the arithmetic mean concentration. For this recommendation to have relevance, the data must be normally distributed (emphasis added)."

Although CWMCS believes that assumptions upon which a RA is based should not require regulatory non-compliance, the following specific comments on the SHHRA are provided. It must be noted that this is not a comprehensive list of issues, only a summary of major concerns.

SPECIFIC COMMENTS:

1. Comment: Section 2.0, Page 1

"...however, the compound was not considered to be an actual CPC until the detected concentrations were compared to representative background concentrations."

Background samples selected by PRC for the supplemental RA differ from those selected by CWMCS. Due to the nature of the fill material on which the facility and adjacent piers were constructed, CWMCS determined that the use of the native clay was a more appropriate material for use as background.

2. Comment: Section 2.0, Page 2

"Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties."

See CWMCS response to U.S.EPA June 3, 1994 letter, General Comment #2 of Attachment II.

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3. **Comment: Section 3.2.1, Page 6**

Referring to the U.S.EPA's June 3, 1994 letter, Attachment II, General Comment #5, states: "Furthermore, as discussed in specific comments regarding Section 3.0, the RA should be revised to include two exposure areas: (1) the area within the fence and (2) the rest of the facility." The first paragraph under section 3.2.1 of U.S.EPA's SHHRA indicates: "To consider potential variation in exposure at the facility, PRC identified three separate exposure areas (A, B, and C) for both groundwater and soil...". The Agency's comment and the Agency's SHHRA are inconsistent.

4. **Comment: Section 3.2.1, Page 6**

"The exposure areas for groundwater and surface soil are coincidental..."

This statement is misleading, in that soils from 0 to 10 feet below grade were evaluated by PRC in the supplemental RA. The definition of surface soils as used in the CWMCS RA is 0 to 6 inches below grade.

5. **Comment: Section 3.2.1, Page 7**

The descriptions of each of the Areas: A, B, and C, for soil/groundwater, and Areas 1 and 2 for sediment, are incorrect. Area A is the northern portion of the facility. Area B is the southern portion of the facility upon which the existing incineration facility is located. Area C is the west end of the pier. Definition of these areas is of fundamental concern to the risk assessment.

The sediment exposure areas take into account, only those areas immediately north of the biobeds and the vault. None of the remaining data has been used. This provides a skewed perspective of the actual sediment conditions surrounding the facility with which the subsistence fisherman may be exposed.

6. **Comment: Table 2**

Area A: samples FG-3, FG-8, FG-10 and G123S should have been included in this area based upon the boundaries defined by the other sample points.

Sample location D2 should not have been included as only stratigraphy information was collected from this location and no analytical data is available.

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Area B: Samples FG-3, FG-8 and FG-10 should not be included in this area, but in Area A instead, due to the boundaries defined by the remaining sample points.

Sample location B339 should have been included in this area based upon the boundaries defined by the other sample points.

Numerous sample location have been identified and evaluated as being on asphalt surface when they are not: P-329, FG-4, FG-10, G-330, C-4, FG-8, FG-3.

AREA C: Samples B-304, FG-16, SS-10, SS-22, G-120S, G121S and G-124S should have been included in this area due to the boundaries defined by the other sample points.

Sample location D-1 should not have been included, as only stratigraphy information was collected from this location and no analytical data is available.

Areas 1 and 2: The sample points listed include both sediment and surface water samples. Only sediment sample should have been used.

Additionally, reference the comment on Section 3.2.1, page 7.

GENERAL: Many of the sample points presented in this table should not be included as the analytical data is representative of samples which were collected from greater than ten (10) feet below ground surface. These locations are summarized on the attached Table 1.

7. Comment: Section 3.2.2, Page 9

The SQL's were provided with the data in the form of the ETC MDLs, as specified in the CWMCS RFI Report.

8. Comment: Section 3.2.2, Page 9

In performing the analysis of the data's distribution and the statistical comparison to background concentrations, what values were used when a ND value was reported if the one-half SQL values were not used?

9. Comment: Section 5.0, Page 17

PRC should provide to CWMCS the information which they found to be "incomplete or conflicting".

10. Comment: Section 5.0, Page 17

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Information on tentatively identified compounds (TICs) was not provided by CWMCS, as this data was not collected by CWMCS as a part of the RFI. The approved workplan included a list of analytical constituents to be evaluated, U.S.EPA's split samples deviated from the list of constituents.

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Comments on U.S.EPA's

Supplemental Human Health Risk Assessment Technical Review

TABLE 1

Groundwater Sample Locations Greater Than Ten (10) Feet Below Ground Surface

<u>Sample Location</u>	<u>Depth of Sample</u>	<u>Sample Location</u>	<u>Depth of Sample</u>
G302	12.29(1)	FG1-GW	9-12'
	11.80(2)	FG2-GW	9-11.5'
G318	10.60(1)	FG3-GW	9-12'
G324	10.67(1)	FG4-GW	9-13'
G336	10.24(1)	FG5-GW	9-13'
G342	10.85(1)	FG6-GW	9-11'
	10.18(2)	FG7-GW	9-12'
		FG8-GW	9-13'
		FG10-GW	10-11'
		FG11-GW	10-11'
		FG12-GW	9-11'

Note: Number in parenthesis indicates whether the sample was collected during Phase I or Phase II of the RFI Field Investigation.

Note: Depth of water from ground surface not obtained for the HydroPunch samples.

TABLE 1 continued

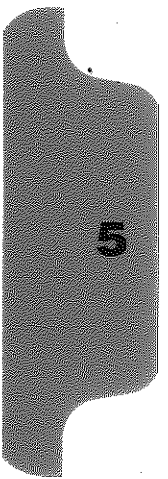
Soil Sample Locations Greater Than Ten (10) Feet Below Ground Surface

<u>Sample Location</u>	<u>Depth of Sample</u>	<u>Sample Location</u>	<u>Depth of Sample</u>
* B301F1	8-11'	B328F1	10-12'
B301F2	14-17'	B328F2	14-16'
G302F2	15.5-17.5'	P329F2	14-16'
G303F2	16-18'	G330F2	12-14'
* B304F1	8-11'	B331F2	12-14'
B304F2	14-18'	G332F2	12-14'
G305F2	14-16'	B333F2	12-14'
B306F2	12-14'	G334F2	12-15'
G307F2	12-14'	B335F2	12-14'
G308F2	12-14'	* G336F1	9.5-12.5'
B309F2	16-18'	G336F2	14-16'
* B310F1	8-11'	* G337F1	8-12'
B310F2	14-16'	G337F2	14-16'
B311F2	16-18'	B338F2	12-14'
B312F2	12-14'	B339F2	10-12'
B313F1	10-12'	B341F2	10-12'
B313F2	14-16'	G342F2	10-12'
G314F2	12-14'	G343F2	10-12'
B315F2	12-14'	G344F2	10-12'
P316F2	15-17'	B345F2	10-12'
G317F1	10-12'	G347F2	10-12'
G317F2	14-16'	G348F2	10-12'
* G318F1	8-11'	FG-1D	12-14'
G318F2	14-16'	FG-2D	12-14'
P319F2	14-16'	FG-3D	14-16'
B320F1	10-12'	FG-4D	15-17'
B320F2	14-16'	FG-5D	12-14'
B321F1	10-15'	FG-6D	13-15'
B321F2	15-17'	FG-7D	12-14'
P322F1	10-12'	FG-8D	12-16'
P322F2	16-18'	FG-9D	10-14'
P323F2	12-14'	FG-10D	12-14'
G324F2	12-14'	FG-11D	14-16'
B325F2	16-18'	FG-12D	12-14'
B326F2	16-19'	FG-13D	13-15'
B327F1	10-12'	FG-14D	14-16'
B327F2	14-16'	FG-15D	18-20'
		FG-16D	18-20'
		FG-17D	15-17'

* Sample includes soil sample from both above and below ten (10) feet.

Note: All clay samples were obtained from depths greater than ten feet below ground surface.

8-18-94



ATTACHMENT 5

RESPONSE TO U.S.EPA'S JANUARY 5, 1995 LETTER. Amended to include responses to items requiring additional time.

ATTACHMENT 5

- **Agency Comment:** In item No. 6 of your letter, you state "The REPORT is the product of CWMCS's consultant Dames and Moore. It is reasonable to require comments and revisions to the REPORT that Dames and Moore either disagrees with or believe to be technically incorrect". U.S.EPA disagrees with you that our June 1993 comments and revisions to CWM-CS's REPORT are technically incorrect. The provisions of the 1988 Consent Judgement are binding upon all parties including your Consultant/Agent Dames and Moore. U.S.EPA expects these revisions to the REPORT to be made by either CWMCS or its Agents.

CWM-CS Response: The CWM-CS letter of August 19, 1994 does not state that the Agency's comments are technically incorrect. The comment in the letter is as follows: "It is unreasonable to require comments and revisions to the report that Dames and Moore either disagrees with or believes to be technically incorrect." The reason independent professional contractors are employed in conducting these projects is to provide some assurance that professional judgement will be exercised. A critical word in our response is "believes". The use of this word conveys that there is a difference of opinion. A professional difference of opinion exists on a number of issues contained within the Agency's June 3, 1994 letter.

If the Agency and CWM CS cannot agree on these issues, CWM CS would like to request an "Issue Resolution" process as outlined in the Consent Judgement.

- **Agency Comment:** In Item #4 of your letter, you state that the highest calculated cancer risk is based on a single compound found in a single sample collected from a single location. However, the procedure followed in the Supplemental Human Health Risk Assessment (SHHRA) in developing exposure point concentrations adheres to the most recent U.S. EPA guidance. Furthermore, Section 5.0 of the SHHRA acknowledges that the calculation of upper-bound exposure point concentrations is one source of uncertainty that may contribute to the overestimation of risk. U.S. EPA believes that the risks presented in the SHHRA were calculated properly.

CWM-CS Response: The Agency correctly summarizes CWM-CS's position on this issue. We generally agree that the Agency

followed screening level Agency guidance in the SHHRA. It is our opinion, however, that the application of guidance which uses a single, high concentration, sample to conclude that an entire area, regardless of size, represents an environmental threat is technically questionable. In this case, we prefer to utilize assumptions which are more representative of the overall facility and we believe more representative of the actual risk.

- **Agency Comment:** In Item No. 3 of your letter, you state that the goal of the risk assessment process is to evaluate risk and not establish a "firm basis for corrective action". Your characterization of CWMCS's risk evaluation at the facility is accurate. CWMCS's risk data was presented in the REPORT. However, U.S. EPA's evaluation of the risk data found it lacking in some respect and in some instances we have supplemented the CWMCS risk data in the REPORT by preparing an additional risk assessment to compensate for the missing information in the CWMCS Human Risk Assessment Report. After carefully reviewing CWMCS's risk data and the supplemental data, U.S. EPA concludes that there is a sufficient threat from the CWMCS facility to human health and the environment, due to contaminants discharged to the lake and groundwater contaminant levels exceeding applicable groundwater protection standards for class II groundwater. Also, all future construction activities involving excavation will need to be done by workers wearing personal protective equipment. This conclusion was not based solely on risk data but also on other corroborative data in the REPORT.

CWM-CS Response: In the Agency's June 3, 1994 letter, it is stated that "Our review of your January 11, 1994, Human Health Risk Assessment report have identified a very serious shortcoming." This shortcoming has not been identified and must be inferred from a review of the Agency's SHHRA. The SHHRA, prepared by PRC Environmental Management, addressed two potential receptors, subsistence fishermen and construction/utility workers. A major concern with the SHHRA is the assumptions related to construction/utility workers. Although not acknowledged in the SHHRA, violations of standard operating procedures as well as OSHA regulations would be necessary to achieve the calculated levels of risk to workers. Although the Agency acknowledges the significance of this issue (January 5, 1995 letter, page 7, first bullet item), the Agency maintains the position that the SHHRA, without correction, should be incorporated into the CWM-CS document. It should be noted that the calculated carcinogenic risks to subsistence fishermen was $6E-08$ to $7E-07$ in the SHHRA, Table 4. These levels are generally not of concern.

It is requested that the Agency furnish the language that is intended to be included in any "disclaimer" to the report regarding risk assessment. Further, is it the Agency's intention to include the SHHRA furnished with the June 3, 1994

letter in the disclaimer?

• **Agency Comment:** In Item No. 2 of your letter, you state that U.S. EPA has ignored analytical data collected on surface water and sediments and has reached significant conclusions concerning the project by relying on flux calculations. CWMCS stated that flux calculations for contaminant discharges into Lake Calumet were useful to help determine where samples should be collected.

U.S. EPA has not ignored surface water and sediment analytical data obtained during the RFI. CWMCS seems to have misinterpreted paragraph 3 of the June 3, 1994 letter. Paragraph 3 stated that U.S. EPA reached a conclusion after all of the information in the REPORT, including flux calculations and comparison of class II groundwater protection standards to onsite groundwater contamination levels, was evaluated and considered.

CWMCS' response is inconsistent with the agreement reached between U.S. EPA and CWMCS before preparation of the draft RFI report. Under that agreement, flux calculations were considered necessary to demonstrate the effect that groundwater contamination may have on human health and the environment. In fact, in the draft RFI report, CWMCS proposed that modeling and flux calculations be used to establish alternative groundwater concentration levels.

Finally, contrary to what is stated, these flux calculations were not voluntarily performed by CWMCS to determine where samples should be collected at the CWMCS facility. Rather, CWMCS agreed to perform these calculations after being requested to do so by U.S. EPA. U.S. EPA and CWMCS have used modeling techniques to calculate the contaminant fluxes. These calculations are based on groundwater analytical data and hydrogeologic data obtained by CWMCS during the RFI. However, because contaminants discharging to the lake are infinitely diluted, the organics measured in surface water are mostly nondetectable. This finding is not at all surprising. On the other hand, both CWMCS and U.S. EPA calculations indicate that contaminants are discharged to the Lake. CWMCS has failed to address the large number and concentrations of contaminants detected in groundwater that discharge to the Lake based on the facility's hydrogeologic conditions. These contaminant discharges should be addressed in the CMS.

CWM-CS Response: Essentially, the workplan prepared for this project relied upon collection of environmental samples. Samples were subjected to rigorous analytical QA/QC procedures and data was validated. The Agency recognizes that the results are mostly nondetectable and concludes that contaminants discharging to the lake are infinitely diluted.

In the absence of detectable impacts, modelling is utilized by the Agency to demonstrate the effect that groundwater contamination may have on human health and the environment.

This issue must be dealt with in additional detail. However, two important points must be considered. The first, the facility investigation proceeded in two phases. The first phase was a broad facility wide investigation followed by the second phase which focused on potential areas of concern. The second phase involved collection of samples immediately adjacent to the pier. Secondly, the Agency's consultant concluded in Section 3.1.1 of the SHHRA that:

"These receptors may also be exposed to contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993)."

This issue is being further reviewed in preparation of a detailed response. A complete response will require an additional 30 days.

CWM-CS RESPONSE - 2-24-95 Addenda: After further review of this issue, CWM-CS's previous response (see the August 1994 responses to USEPA comments, Attachment I., item 24.) addresses the Agency's concerns. Both the Agency's letter of January 5, 1995 and the SHHRA prepared by the Agency support CWM-CS's position.

The following are U.S. EPA's responses to some of the critical items in Attachment 1 of your RESPONSE:

Part 1

- **Agency Comment:** Item No. 1 concludes, "The presence of continuous or discontinuous sand seams in the lower lacustrine layer is not significant. The lower lacustrine unit is separated from the contaminated fill unit by the upper lacustrine unit. This unit is a homogeneous silty clay soil unit approximately 10 feet thick, in which no contaminants were measured in all soil specimens collected from this layer. Consequently, the unit behaves as a barrier to the migration of contaminants".

U.S. EPA does not believe that CWMCS has provided enough data to conclusively support the hypothesis that sand seams are discontinuous. However, to prevent any further delay in finalizing the RFI Report, the issues regarding whether the sand seams encountered during these investigations are discontinuous should be deferred. CWMCS could state in the RFI Report that both the U.S. EPA and CWMCS disagree on the status of the sand seams encountered during the RFI.

CWM-CS Response: This issue has been discussed on numerous occasions. It remains the opinion of Dames and Moore that the sand seams are discontinuous. Information concerning this subject is being reviewed and will be resubmitted to the Agency within 30 days.

CWM-CS Response - 2-24-95 Addenda: This issue is significant and critical to the finalization of the Investigation Report. Referencing CWM-CS's August 19, 1994 letter to the Agency (specifically Attachment 1, Part 1, Comment 1) a detailed discussion of the sand seam issue is provided. The response summarizes past Agency comments and CWM-CS responses to previously raised questions. Given the volume of information that has been generated, the Agency's observation that "U.S.EPA does not believe that CWMCS has provided enough data to conclusively support the hypothesis that sand seams are discontinuous" is non-specific given the amount of time the Agency has devoted to this issue.

• **Agency Comment:** In Items 3a, 3c and 25, your responses indicate that the potentiometric surface maps correctly depict groundwater elevations in the vicinity of the vault and that the vault liner is a barrier preventing migration of leachate from the vault or infiltration of groundwater into the vault. Also, CWMCS does not agree that contaminants in monitoring wells G-302 and G-336 originate from the vault but from solid waste management unit SWMU #6.

First, no as-built drawings of the vault are available to show how this vault was constructed. Second, the contaminants in wells G-302 and G-336 are likely the result of preferential migration of contaminants from the vault to the lake. CWMCS implies that similar contamination should have been found in well G-318, but this is not necessarily true because the vault's clay liner may be effectively containing migration in the direction of that well. U.S. EPA believes that the vault's integrity is questionable because of contaminants detected in adjacent downgradient wells G-302 and G-336, and because no construction records or data for the hydraulic head within the vault are available to substantiate CWMCS's statements. The vault may be reducing contaminant migration to the lake, but it does not prevent migration to the lake. As stated in CWMCS' response, leachate may have been generated from infiltrating precipitation, which implies that the vault's cap is permeable. The vault's sidewalls and bottom may also be permeable in certain locations, causing contaminants to slowly and erratically migrate toward monitoring wells G-302 and G-336. The vault area should be addressed in the CMS for the facility.

CWM-CS Response: Previous responses on this issue are being

reviewed. To thoroughly respond to this issue, an additional 30 days will be required.

CWM-CS Response - 2-24-95 Addendum: Extensive investigation of the vault area was undertaken and a differences of opinion exists between CWM-CS and the Agency. Regardless of whether or not the vault is intact, the vault area is a SWMU (the former wastewater basin #1) and would be subject to the CMS, if required.

- **Agency Comment:** In Item No. 4, you state that after re-evaluating groundwater results, it was determined that inorganic compounds, including metals, do not indicate a contaminant distribution pattern. CWMCS states that it is impossible to determine if the onsite SWMUs or fill material are the sources of metals in the groundwater. CWMCS also states that the reason metals are not useful in identifying a contaminant distribution can be seen by comparing sample results from phase I and phase II.

U.S. EPA disagrees that inorganic compounds, including metals, do not indicate a contaminant distribution. U.S. EPA also evaluated all of the phase II groundwater sampling results in the REPORT, including soil sample results. A contaminant distribution pattern is still evident. The phase I sampling results were not evaluated because CWMCS has always insisted that the phase I results were unreliable.

CWM-CS Response: An additional 30 days is required to further consider this issue and provide an adequate response.

CWM-CS Response - 2-24-95 Addendum: The Agency insists that a contaminant distribution pattern is evident. Without additional information on the issue, CWM-CS cannot review the Agency's conclusions.

- **Agency Comment:** The response in Item No. 5, indicates that contamination detected in well G-349 is from an upgradient source rather than from one of the SWMUs investigated during the RFI. CWMCS is responsible for investigating the extent of contamination at the facility, and CWMCS should investigate whether a SWMU or other source on the facility caused this contamination. This source should be addressed in the CMS.

CWM-CS Response: The responsibility to investigate the facility upgradient from the former G-349 well location is being evaluated. This effort will require an additional 30 days.

CWM-CS Response - 2-24-95 Addendum: The former well location, G-349, is located close to the facility's southern and eastern property lines. Identified SWMUs are generally downgradient from this location. If a CMS is warranted, this area will be further considered.

- **Agency Comment:** In Item No. 7, CWMCS states that groundwater sample results for wells located between the SWMUs and the lake do not support U.S. EPA's belief that groundwater moving through the fill is contaminating the lake. U.S. EPA does not agree. Evaluation of the RFI data indicates that contaminants detected at various monitoring wells screened adjacent to the lake and within the source areas of the facility migrate slowly from the facility to the lake. The contaminants are diluted in the lake but continue to deteriorate the lake's water quality.

CWM-CS Response: The facility's approved workplan relied upon collection and analysis of Lake Calumet samples to establish the quality of Lake Calumet water.

- **Agency Comment:** In Items 8, 10 and 24, your responses are seemingly opine that U.S. EPA's flux calculations are simplistic and unrealistic. CWMCS also states that its calculation of contaminant fluxes using a "next-level-of-sophistication" model results in estimates of discharges that are one order of magnitude lower than those calculated by U.S. EPA.

U.S. EPA's calculations were intended to be simple in order to demonstrate the effect of facility contamination on the environment and to provide examples (such as for benzene, 1,1-dichloroethene, and vinyl chloride at three well locations) of the calculations that the RFI report lacked. U.S. EPA's calculations are realistic given the RFI data and the hydrogeologic conditions at the facility. CWMCS's complex model is, in fact, unrealistic given the facility conditions, and it yields results for the mass rate of discharge of benzene identical to those of U.S. EPA's simpler calculations. U.S. EPA and CWMCS benzene flux results differ by an order of magnitude only because U.S. EPA's assumed area of contaminant discharge is an order of magnitude larger than CWMCS's. Even if an order of magnitude difference exists between the results of these calculations, it is not surprising given the variable hydrogeological data presented in the RFI report. In any case, U.S. EPA and CWMCS flux calculations both indicate that contaminants discharge to the lake, thus degrading the lake's water quality, but CWMCS has not addressed discharges of the multitude of contaminants detected at high concentrations (relative to applicable groundwater protection standards) throughout the facility. These contaminant discharges should

be addressed in the CMS.

CWM-CS Response: An additional thirty (30) days is required to prepare a response to this issue.

CWM-CS Response - 2-24-95 Addendum: CWM-CS reiterates that previous responses have addressed the Agency's comments. (see responses to Agency comments, Attachment I, item 24.)

- **Agency Comment:** The response in item No. 26 does not address U.S. EPA's comment. The sentence "This contaminant distribution pattern of the fill sample is a reflection of groundwater sample results" should be rewritten as follows: The groundwater sampling results are a reflection of the contaminant distribution pattern in the soils and SWMUs at the facility.

CWM-CS Response: Additional time is required to respond. A response will be prepared within thirty (30) days.

CWM-CS Response - 2-24-95 Addendum: CWM-CS reiterates that the response to item No. 26 as presented in Attachment I in the August responses addresses the Agency's comment.

- **Agency Comment:** Your response in Item No. 27 did not adequately address U.S. EPA's comment. CWMCS claimed that these polynuclear aromatic hydrocarbons (PAHs) are ubiquitous. On page 23, paragraph 4, the text of Attachment I indicates that the major sources of PAHs contamination are wind, scouring of the lake, and sediment transport by wave action. On page 21, paragraph 4, the text indicates that contaminants in sediments at sampling location S-1 are the result of precipitation runoff and industrial activities in the Lake Calumet area. These explanations are reasonable when applied to the entire area, but PAH contamination in sediments adjacent to the facility is more likely the result of runoff from waste management areas within the CWMCS facility. The contaminated sediments in close proximity to the CWMCS facility must be addressed regardless of whether these contaminants resulted from precipitation runoff. PAHs contaminants identified in the sediment samples also occur in high concentrations in the leachate samples collected from the onsite vault.

U.S. EPA has also compared the dry weight of the parameters found in the sediment sample at S-1 to conservative/screening benchmarks to determine if there is any potential for adverse ecological effects due to these sediment contaminants.

The benchmark shown in the table (Attachment 1), are the

lowest effect level (LEL) from the "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (Persaud, et al.). The effects range median (ER-M) is from the National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NOS OMA 52 (Long and Morgan), and U.S. EPA sediment quality criteria (SQC).

The dry weight ($\mu\text{g/g}$) of each parameter has been converted to the organic carbon normalized concentration ($\mu\text{g/g}_{\text{oc}}$) to facilitate comparison with the SQC benchmarks. Since no total organic carbon (TOC) value was provided with the data, the TOC was assumed to be 3% for the calculations done here. The conversion is:

$$\mu\text{g/g} \div (\% \text{ TOC} \div 100) = \mu\text{g/g}_{\text{oc}}$$

$$10.1 \mu\text{g Phenanthrene/g} \div (3 \div 100) = 336 \mu\text{g/g}_{\text{oc}}$$

At sampling location S-1, all of the polycyclic aromatic hydrocarbons (PoAHs) exceed the benchmarks for individual PoAHs and total PoAH. Phenanthrene exceeds the U.S. EPA sediment quality criteria. Based upon this review, further evaluation of the sediments in the proximity of sampling site S-1 is warranted to determine the level of risk to ecological receptors in the vicinity of the site.

Finally, U.S. EPA re-evaluated your response to your conclusion regarding the absence of "any discernable immiscible or dissolved contaminant plumes" originating from the CWMCS facility. We conclude that your claim is incorrect. Volume 3, Appendix L of the RFI REPORT shows that two major dissolved groundwater plumes have existed for various volatile organic compounds (VOC) during both phases of the RFI. One of these plumes encompasses the former biobed area and the Hyon tank farm area. The second plume emanates from the wastewater basin west of the vault, which may be indicative of contamination emanating from the leachate vault. The dissolved VOC plumes depicted in Appendix L include organic compounds such as benzene, 1, 1-dichloroethene, phenol, 2,4-dichlorophenol and the semivolatile compound naphthalene. In addition, a dissolved arsenic plume is also evident for phase 1. Other plumes are also likely to exist, because the number of organic compounds detected in the onsite groundwater monitoring wells and soils is greater than the number of compounds depicted in Appendix L.

In addition, immiscible contamination such as floating oil and solvent mixtures was observed during field sampling at various locations, particularly adjacent and west of the leachate vault and in the biobed area. Evaluation of the RFI data indicates that these plumes slowly discharge to Lake Calumet and therefore degrade the water quality in the long term.

Therefore, corrective measures to alleviate contaminant discharges to the Lake are necessary and must be addressed in the CMS.

CWM-CS Response: An additional thirty (30) days is required to respond to this issue.

CWM-CS Response - 2-24-95 Addendum: Part 1, Section 4.4, Surface Water and Sediment Analytical Results, Final RCRA Facility Investigation Report submitted to the Agency in November 1993, provides information on the sediment quality throughout Lake Calumet. The Basis for CWM-CS's conclusions concerning the quality of Lake Calumet are based upon independent studies of Lake Calumet are based upon independent studies of Lake Calumet by the authors referenced in the REPORT.

Sediment quality issues are addressed in the Ecological Risk Assessment (ERA). Management of sediment quality data should be discussed in the context of the ERA.

The Agency's original comment, contained in the Agency's June 3, 1994 letter relates to Page 105, Section 4.4 of the Final RCRA Facility Investigation Report submitted to the Agency in November 1993. It must be noted that Section 4.4 is entitled *Surface Water and Sediment Analytical Results*. This section discusses the surface water and sediment analytical results. Therefore the conclusions contained within this section concern surface water and sediment issues. In light of this information, CWM-CS believes that the Agency should reconsider the conclusion concerning the correctness of CWM-CS's observations.

CWM-CS has contacted individuals involved in not only this investigation but employed by the facility for years. There is no recollection of immiscible contamination visible on the waters of Lake Calumet. Similarly, no immiscible materials were observed on any samples collected in the referenced areas during the RFI investigation. Regardless, most immiscible materials have solubilities such that the materials would be detected by the analytical program associated with this project.

- **Agency Comment:** The response in Item 28 seems to imply that there are risks from Lake Calumet to recreational users and from fish ingestion. However, dermal absorption or incidental ingestion and fish ingestion are not viable pathways. CWMCS has not clearly defined these risks from Lake Calumet or the source(s) and the appropriate pathways associated with these risks. More importantly, CWMCS must explain any correlation between these risks and the management of hazardous waste at the facility, if any. It has been documented in the REPORT

that the groundwater in the fill is highly contaminated and the majority of the hazardous constituents in the groundwater are expected to be released to the Lake. U.S. EPA also is aware that it may be difficult to quantify risk from fish ingestion due to the industrial activities within the Lake area.

CWM-CS Response: "Fishermen have been observed fishing in Lake Calumet near the CWMCS Incinerator facility. These fishermen may come in contact with contaminated sediments while standing on the edge of the lake or as a result of wading into the lake. These receptors may also be exposed to contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993). Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties." The paragraph is a direct quotation from the SHHRA (Section 3.1.1.) prepared by U.S. EPA's consultant. CWM-CS is hopeful that this responds to the Agency's question.

Part 3

- **Agency Comment:** In Item No. 1, the response states that U.S. EPA's conclusion that it is necessary and practical to restore damaged areas to original condition or as close as possible is irresponsible and unsupported by a technical justification particularly without the benefit of a CMS. To reiterate, the purpose of the RFI is to determine the nature and extent of releases of hazardous waste or hazardous constituents from regulated units, SWMUs and other source areas at the CWMCS facility, and to gather all necessary data to support a CMS and if necessary to remedy these releases. The data and conclusions, as established in the REPORT, to a large extent corroborate and support U.S. EPA's position that the groundwater and soils at the CWMCS facility are highly contaminated and, as such, must be remediated. In addition, soil samples adjacent to the facility were also analyzed and found to contain hazardous constituents. The CMS should now contemplate proposals to remedy these releases. It is not irresponsible to require CWMCS to remedy these releases. Section 3008(h) clearly authorizes U.S. EPA to require corrective action or any other response necessary for any releases of hazardous waste from a facility to protect human health and the environment.

CWM-CS Response: CWM-CS's original response is as follows and

remains appropriate and applicable:

"Facility environmental investigations require consideration of issues beyond the facility boundaries. Consideration of the potential impacts from local landfills and 100 years of industrial activity within the Lake Calumet area are necessary to determine impacts of these activities on the facility.

The Agency's conclusion that 'it is necessary and practical to restore this damaged area to original condition or as close as possible' is irresponsible and unsupported by a technical justification at this time, particularly without the benefit of a CMS."

- **Agency Comment:** The response in Item No. 2 does not address U.S. EPA's comment. U.S. EPA requested that the CMS consider soil cleanup levels protective of groundwater quality standards found in 35 Illinois Administrative Code (IAC) Subpart B, Sections 620.10 and 620.20. However, CWMCS's response does not address this issue. In addition, on-site monitoring well data should be compared to Class II groundwater protection standards and upgradient monitoring well data to establish whether significant contaminant releases from the facility to groundwater have taken place.

CWM-CS Response: An additional thirty (30) days is required to respond to this issue.

CWM-CS Response - 2-24-95 Addendum: The Illinois Administrative Code (IAC) has been reviewed again. The Illinois Groundwater Quality Standards (IAC, Title 35-Environmental Protection, Subtitle F-Public Water Supplies, Chapter I - Pollution Control Board; Adopted effective November 25, 1991; Amended effective September 11, 1992) as published by the Bureau of National Affairs, Inc. does not appear to have a Subpart B, Section 620.10 or 620.20. CWM-CS believes that the IAC references to 35 IAC 620.420 is correct.

The following are U.S. EPA's responses to Attachment II in your RESPONSE:

Agency Comment: In item No. 6, U.S.EPA acknowledges the existence of Occupational Safety and Health Administration (OSHA) rules and regulations that require the use of personal protective equipment (PPE) to limit or prevent exposure to hazardous contamination. U.S. EPA does not condone or encourage any violations of these rules and regulations. However, in almost any industrial situation instances may arise in which PPE is not used or PPE is damaged, resulting in exposure to contamination. At a minimum, the baseline RA report should acknowledge that the use of PPE is not foolproof

and that exposure to contamination may occur despite attempts to follow OSHA rules and regulations.

CWM-CS Response: Originally the Agency stated (June 3, 1994 letter):

".... and (2) consider exposure that may result if workers fail to adhere to administrative controls such as personal protective equipment requirements; this would be the case at a typical construction site."

The SHHRA prepared by PRC Environmental Management for U.S.EPA assumes that engineering controls are not in place and workers do not use PPE. The Agency should further consider the implications of this issue.

- **Agency Comment:** In response to Item No. 11, Section 5.7.4 of U.S. EPA's *Risk Assessment Guidance for Superfund (RAGS)* indicates that, in general, anthropogenic background chemicals should not be eliminated from the baseline RA because it is extremely difficult at the baseline RA stage to conclusively show that such chemicals (in this case, trichloroethene) are not related to the facility or the surrounding area. Furthermore, trichloroethene was detected in surface soil. It is difficult to imagine how trichloroethene, a volatile organic compound, migrated onto the facility solely from an off-site location and remained on the facility at a concentration high enough to be detected during sampling. The presence of trichloroethene in the surface soil suggests a more immediate and localized source of the contamination. Because the presence of trichloroethene in the surface soil at the facility cannot be attributed solely to off-site sources, the baseline RA report should justify the exclusion of trichloroethene as a contaminant of potential concern based on anthropogenic considerations.

CWM-CS Response: To fully evaluate this issue an additional thirty (30) days is required to prepare a response.

CWM-CS Response - 2-24-95 Addendum: The following text was added to the HHRA: "Given that the area surrounding the CWMCS facility has historically been a heavily industrialized area, anthropogenic contamination of a variety of organic chemicals is expected, especially given the heterogeneous fill material used to create land surfaces around Lake Calumet. Numerous past and current sources of TCE other than the CWMCS facility are likely. In this case, use of statistical comparison to eliminate compounds not detected in facility samples at levels significantly higher than baseline levels is appropriate. Furthermore, the addition of TCE as a COPC would not alter risk estimates, since EPA has withdrawn all toxicity values

for TCE from IRIS. Risks associated with exposure to TCE cannot be evaluated quantitatively."

- **Agency Comment:** In Item No. 31, your response misses the point of U.S. EPA's original comment. The comment was not referring to resuspension of dust from workers' skin and subsequent inhalation; rather, the comment was referring to the possibility that some of the contaminated dust could be inhaled at the same time that the dust is being deposited on workers' skin. Specifically, the baseline RA report should evaluate the potential for total exposure to fugitive dusts. Also, the baseline RA is supposed to consider reasonable maximum exposure (RME) conditions. Under such conditions, it is reasonable to assume that hygiene practices are not completely followed. Many industrial workers who work out of doors do not have well washed their hands; thus these workers may be exposed to contaminated soil via incidental ingestion of soil. The baseline RA should evaluate the potential for exposure to contaminated soil via incidental ingestion.

CWM-CS Response: Wording of U.S.EPA's original comment was misinterpreted. Please reference the tables 5-3, 5-4, 5-5 and 5-6 of the Human Health Risk Assessment for the required information.

The following are U.S. EPA's comments to Attachment III in your RESPONSE:

- **Agency Comment:** In Item 1, you stated that it is outside the scope of the ERA report to compare the contaminants detected in surface water and sediment samples to those detected in samples collected at the facility. Because the source of pollutants in Lake Calumet is pertinent to the ERA and because the ERA report discusses the possibility that other sources are responsible for the contamination, some reference to on-site sample results is needed. Although a detailed discussion may not be necessary, at a minimum the ERA report should state whether some or all of the contaminants were also detected at the facility and should refer to another part of the RFI report where this comparison is made.

CWM-CS Response: An additional thirty (30) days are required to prepare a response to this issue.

CWM-CS Response - 2-24-95 Addendum: The following text was added to the ERA: "The following COPCs detected in sediments were also detected in facility soils: antimony, beryllium, chromium, lead, mercury, zinc, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, methylene chloride, phenanthrene, and pyrene. While it is possible that the

presence of some of these contaminants could have resulted from releases from the facility, it is important to keep in mind that numerous other sources of PAH releases into Lake Calumet have been identified. For example, samples taken from various landfill sites around Lake Calumet contained elevated levels of heavy metals and polycyclic aromatic hydrocarbons (PAHs) (IDENR, 1988). According to IDENR (1988), priority pollutants most likely to occur in Lake Calumet sediments include arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc, DDT, dieldrin, PCBs, di-n-butyl phthalate, and PAHs."

- **Agency Comment:** In Item No. 2, you stated that a survey conducted by Dames & Moore on September 27, 1993, will be referenced to support the conclusion that no threatened or endangered plant and animal species are present at the facility. This response partly addresses U.S. EPA's comment, but additional information is needed to substantiate CWMCS's conclusion. Information on specific areas at the facility, the methods used to conduct plant and animal surveys, and the conditions at the facility during the surveys (including weather conditions and other types of activities that were being conducted, and so on) should be provided.

CWM-CS Response: The "survey" conducted by Dames & Moore on September 27, 1993, consisted of personal observations made by field biologists during a brief site visit. Formal plant and animals surveys were not done, but notes based on species that occurred on or near the facility at that time were made. These observations can be used to substantiate the judgment that no T & E species were present at the facility at that time.

- **Agency Comment:** In addition, other supporting references are needed to determine whether threatened or endangered species (state-listed as well as federally designated) occur at the facility. The local office of the U.S. Fish and Wildlife Service (FWS) was contacted for information. However, because the information that FWS offers may be limited, a review of the Illinois natural heritage database should be requested to supplement the information already obtained. Also, a single survey performed on a single day is not sufficient to demonstrate the absence of bird species. Because bird counts are done annually in the vicinity of the facility, the Chicago Audubon Society should be contacted for additional information about sightings of threatened or endangered bird species at the facility and in areas adjacent to Lake Calumet. The assumption that threatened or endangered species will not use the facility or surrounding areas may be inaccurate given the high concentrations of birds that are known to pass through

the Lake Calumet area.

CWM-CS Response: The Illinois Natural Heritage Database was examined. Deanna Glosser, Endangered Species Protection Manager of the Illinois Department of Conservation searched the Illinois Natural Heritage Database and provided Dames & Moore with a written record of her findings in a letter dated October 6, 1993. Information provided by Ms. Glosser is summarized in Section 3.1.2 and Table 3-1 of the ERA. Of the 13 Illinois state-listed T & E bird species that could potentially occur in the Lake Calumet area, five (yellow rail, black-crowned night heron, American bittern, red-shouldered hawk, and northern harrier) have been observed in the Lake Calumet area. No federally-listed T & E species occur in the immediate vicinity of the facility. Although the Chicago Audubon Society does provide data on annual bird counts, it is doubtful the (1) additional bird species other than those listed in the National heritage Database as occurring in the area would be added to that group; and (2) that any of these species nest or spend a substantial amount of time on facility property.

The ERA did not assume that "T & E species will not use the facility or surrounding areas...." We acknowledge that some T & E bird species may land on, use, and feed on or from the facility but are not likely to nest or spend substantial amounts of time on facility property. Most of the T & E birds species are associated with wetland areas, and no wetlands exist on facility property. The CWM-CS facility consists of an artificial pier inhabited primarily by invader and early successional species.

• **Agency Comment:** In Item No. 4, you provided additional information about threatened or endangered species in the area of the CWMCS facility. However, the first paragraph of the response does not fully address U.S. EPA's comment concerning breeding bird populations. The phrase "or potentially occur" should be deleted from the first sentence because the black-crowned night heron, a state-listed endangered species, is known to nest in the area. In addition, the habits of nearby nesting bird populations should be researched to substantiate the claim that no bird populations should be researched to substantiate the claim that no bird species spend a significant amount of time at or near the facility. Finally, the response addresses only wintering bird populations and does not identify additional species that nest in the area and that forage in Lake Calumet near the facility. The Chicago Audubon Society may be able to provide the missing information.

The response also discusses candidate endangered species known to occur within 5 miles of the facility. The response

mentions that five avian species have been observed in the area, but it lists only three of them. The other two avian species should be identified, and the specific locations of all sightings should be researched so that the proximity of the avian species to the facility can be determined.

CWM-CS Response: It is correct that the black crown night heron does nest in the area. However, individuals of this species are not expected to be exposed to facility related contaminants for the reasons outlined in the REPORT.

Although the species listed in Table 3-1 may represent "only wintering bird populations," this list is considered complete in that it includes information gathered from the Illinois Natural Heritage Database and the Fish and Wildlife Services. Again, although the Chicago Audubon Society does conduct annual bird counts information on T & E species that may occur in the area obtained from two reliable sources, originally recommended by U.S.EPA, is considered complete.

The five avian species known to occur within five miles of the facility are: yellow rail, black-crowned night heron, American Bittern, red-shouldered hawk, and northern harrier.